THE EUREKA CLOCK

by

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ACKNOWLEDGEMENTS

The contents of this book have been based almost entirely on information gleaned from primary sources and personal observation of clocks seen both in private collections or when offered on the open market by the trade. I would like to take this opportunity of expressing my appreciation for the assistance I have so generously received from all concerned, but in particular to:-

George Feinstein

Anthony Fox (Volpone Clocks Ltd.)

Alan Marx

True research is never completed and any additional information would be most gratefully received. There are, for example, a number of historical facts surrounding the manufacture of these clocks that have proved elusive and it would be especially interesting to learn more of the examples marketed in France and America.

CHAPTER 1

HISTORY OF THE EUREKA CLOCK COMPANY

The word "Eureka" has supposedly been used to herald a momentous and wonderful discovery since the days of Archimedes in the Third Century B.C. No doubt the inventor of the electric clock bearing this name felt the same surge of delight as realisation dawned on him of the potential of his discovery.

Timothy Bernard Powers, an electrical engineer, was responsible for designing this clock, but apart from the fact that he was living on Broadway, New York prior to coming to England and that when here he initially gave the Charterhouse Hotel, Charterhouse Square, London and later 361 City Road, London as his address, little is known of him. Patent No. 14,614 taken out in England during 1906 by Herbert Hadden, a Patent Agent, states "the nature of this invention a communication to me from abroad by Kutnow Brothers of 853 Broadway, New York, United States of America". (See Appendix I for full Patent Specification). Other patents taken out shortly afterwards were either under the name of T. B. Powers or T. B. Powers and/or the Kutnow Brothers.

Switzerland	Patent No. 38242	26th October 1906
Canada	Patent No. 100982	11th September 1906
Spain	Patent No. 40976	26th June 1907
France	Patent No. 367856	18th September 1906
United States	Patent No. 853648	14th May 1907
Belgium	Patent No. 193229	16th July 1906
Mexico	Patent No. 5900	30th August 1906
Italy	Patent No. 83764	25th October 1906
Germany	Patent No. 196598	11th July 1906
Austria	Patent No. 32883	10th March 1908
Hungary	Patent No. 41495	4th February 1908
Russia	Applied for — no further information	
Australia	Applied for — no further information	

It would appear that these were all taken out while the parties concerned were all still resident in the United States of America. On the limited evidence available it can only be assumed that Powers approached the Kutnow Brothers for financial assistance in the manufacturing and marketing of his clock.

Sigismund, Hermann and Gustav Kutnow first appear in the street directories of London as Manufacturing Agents and Commission Agents with premises at Australian Avenue, later at Gresham Street and subsequently Holborn Viaduct on the corner of Snow Hill. In 1894 while still at this last address they changed the nature of their business to that of Manufacturing Chemist. Four years later they moved yet again. This change of address was to 41 Farringdon Road which they rented from E. Withers and Son until 1927. It would appear that they moved out of London at this date but continued to operate as Manfacturing Chemists until at least 1939. In this role they were highly successful. One of their products was Anti-Asthmatic Cigarettes (price 2/9d. per box of 20), but they gained much of their fame through "Carlsbad Powders" which it was claimed cured "Constipation, Rheumatism, Gout, and all disorders of the Liver, Stomach, Kidneys and Bowels", and which were "Prescribed for and used by the British Royal Family".

Figure 1

Contemporary view of City Road, showing typical dwelling houses built during the 19th century with part of the modern building which now covers the site of 361/363.

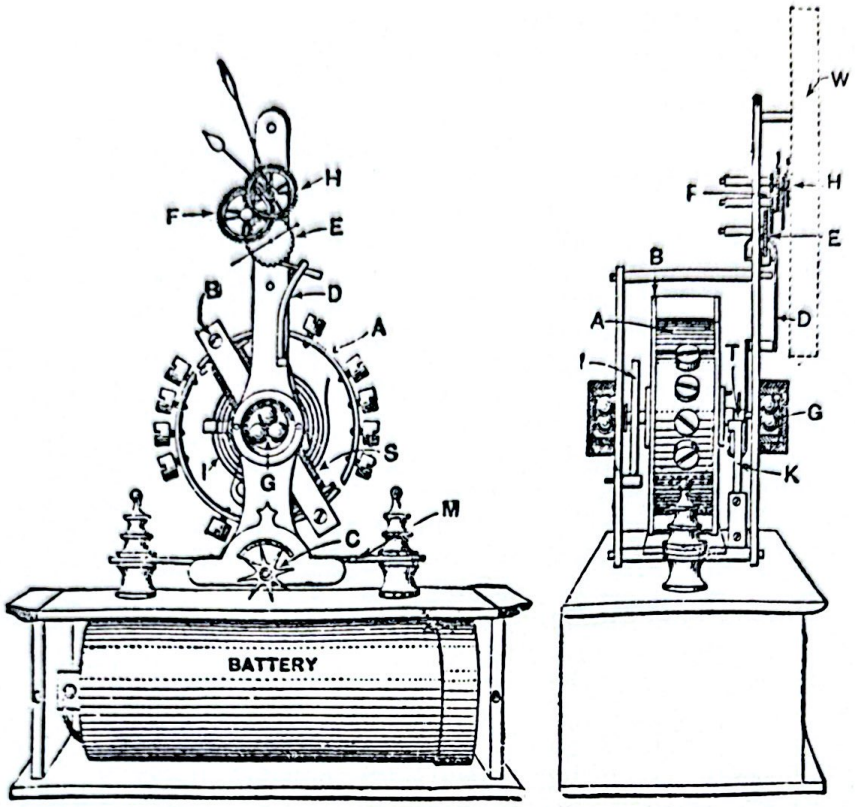
It has been possible to trace some of the original agreements and documents of the Company formed to manufacture and market these clocks. From these papers it has been ascertained that a private company—the Eureka Clock Company Limited—was formed in 1908 by the Kutnows and Frank Jowett, who later became the Company Secretary. According to the Return of Allotments of the Company dated the 30th July, 1908 the number of Ordinary Shares allotted was 18,300 (Nominal amount of each being £1) while those of Founders' Shares were 183. T. B. Powers was given 2,500 Ordinary £1 Shares and 25 Founder £1 Shares in an agreement of the same date " in consideration of the premises " with no mention of his being the inventor of the clock. This is curious but perhaps the available records are incomplete. The premises mentioned would have been 361/363 City Road, London, E.C. and by December, 1908 this was the official registered offices of the Company. By December, 1908 a further 9095 Ordinary Shares and 95 Founders' Shares had been allotted bringing the total to 27,395 and 278 respectively. Shareholders now included Export Merchants (Gabriel Ferme of Paris), London Merchants and a Wholesale Silversmith as well as a Baronet (Alfred

James Newton of 17 Cumberland Terrace, N.W.) and numerous 'Gentlemen'. By the beginning of 1910 the Share Capital was £30,300 (see Appendix II).

Unfortunately many of the relevant Rate Books have been lost or destroyed so it is only possible to obtain a somewhat hazy impression of the nature and size of the premises. Most of the property in the City Road was originally built in the early part of the nineteenth century for residential purposes. See Figure 1. By 1908, however, many of these dwellings were housing light industries such as bookbinding, the felt trade, engravers, small tool makers etc. with the original occupants having moved to more salubrious areas. A similar situation exists today. It is not clear exactly who originally occupied the buildings on the site of 361 and 363 City Road but the rates were paid by a gentleman named Cox. Sometime during 1900 the building or buildings were pulled down and a "warehouse" built on the site of 361 to 363. In 1906 the joint tenement was held by William and William Howard Wood of Hornsey Lane and Muswell Hill respectively. There is no indication who actually occupied it. The Rate Books between 1906 and 1915 cannot be traced! However, in 1915/16 the building on this site is described as having a Basement, Ground Floor and five further floors. The total rateable value being £448 compared with that of the house at 359 which was £59. It would be justified in assuming that the Eureka Company took over a sizeable modern property in which to commence manufacturing. In the 1950's the site and adjoining property were further developed and the present building erected, thus leaving no trace of the Eureka clock factory. Unfortunately the Local History section of the Borough Library could not trace any contemporary photographs neither did the Company themelves portray the building on any of their advertising matter. Strangely enough none of the local inhabitants spoken to can recollect the factory!

The clock was marketed the following year (1909). Among the contemporary news items of Shackleton's knighthood for his attempt to reach the South Pole; the increasing militancy of the Women's Suffrage Movement; Bleriot's first cross Channel flight from Calais to Dover; the opening of Selfridge's London store and the discovery of bakelite by Leo H. Baekeland we find editorials relating to the Eureka Clock entitled "The Wonderful 1,000-day Clock."

> The new electric clock which was submitted recently to the King by Mr. Sigismund Kutnow, is like most successful inventions, very simple.
>
> Though it never needs winding, runs without attention for over a thousand days, will go upside down, and is undisturbed by vibration, there are barely half a dozen wheels in its mechanism. A single dry cell battery, purchasable anywhere for a few pence, is fixed underneath or at the back of the clock. From this one of the wires is connected to the plate of iron which runs horizontally at the base of the clock.
>
> Above this metal plate hangs a large wheel constructed like the balance wheel of a watch, which just clears the plate as it rotates. At the back is a spring similar to the hair or oscillating spring of a watch.
>
> This wheel has a small magnet running through its centre, which is magnetised on the connection of the electric current, and pulls its end on the surface of the wheel round towards the horizontal plate below.
>
> The point is then to utilise this pulling power of the magnet just at the moment that it will give the necessary impetus to the wheel. This is effected by a thin strip of steel which is connected with one terminal of the battery, the other, as previously explained being connected with the horizontal plate just below the wheel. As the wheel swings round this strip of steel comes in contact with a knob, through which the current passes, and the magnet becoming charged the point is pulled down sharply to the horizontal plate. Passing over this the magnet is demagnetised and the wheel swings on till the force of the oscillating spring brings it back again.
>
> The oscillation is timed and can be regulated by the spring behind to take exactly a second each way. The movement is conveyed directly by a lever to the second hand and the minute and hour hands are connected in the usual manner.
>
> *The Daily Mail Wednesday, June 9, 1909.*



Electrically-Driven Self-Contained Clock (*Eureka Clock Co.*).

Figure 2

Taken from Electric Wiring Fittings, Switches and Lamps, 4th edition, 1911 by W. Perrin Maycock but identical illustration to that appearing in the promotional editorials appearing in the 1909 newspapers.

The illustrations accompanying this article show the movement as seen in Figure 2, (a line drawing showing a side view of the movement) and a photograph of the cased movement. This was a four glass case with the battery housed in the base. The interesting points noted were:

1. This was a tall movement with the balance wheel below the dial.
2. There were three balls in the bearing housing.
3. There was a small subsidiary seconds dial.
4. The plate showing the rating star and scale carried no details concerning the patent number, date, manufacturers' name etc. as is customary. This was possibly on the dial but as the copies of this particular newspaper kept at the Newspaper Library at Collindale are not originals fine detail such as this has been lost in the reproduction.

The comment is made by some present day writers that the facts originally published by the newspapers and trade journals were incorrect. Upon studying these documents however it would appear that in most cases they were accurate **when related to the clock that was being demonstrated at that date.** In other words this was to some extent still a prototype and was not the final model marketed in the Autumn of the same year as the advance publicity.

The Kutnows were well versed in the art of publicity and as already indicated in the previously quoted newspaper comments even managed to obtain an audience with the King.

> " Court Circular Buckingham Palace, June 5 — Mr. Sigismund Kutnow has had the honour of submitting for the King's inspection the ' Eureka Electric Clock ' and of personally explaining the mechanism to His Majesty."
>
> *The Times, 5th June, 1909.*

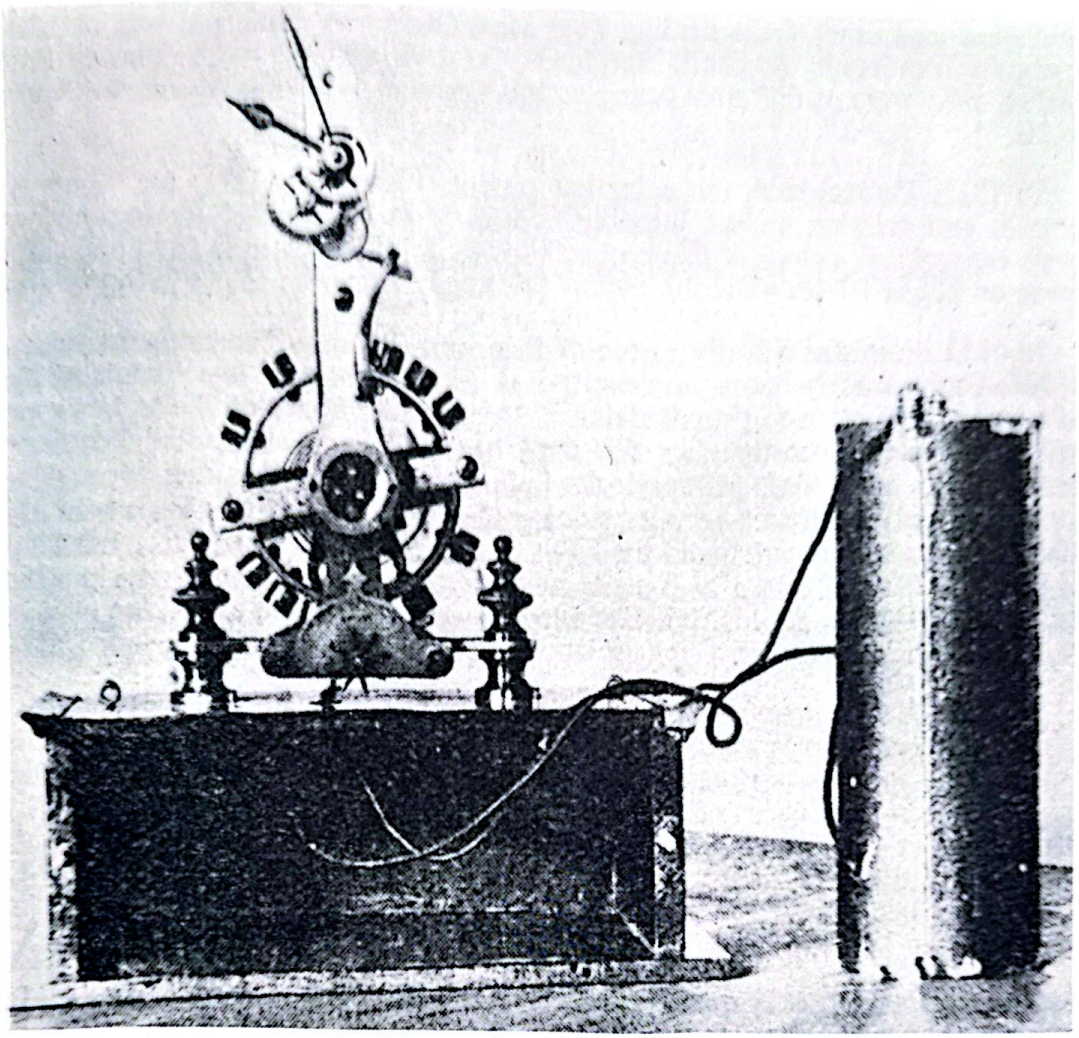


Figure 3
This illustration appeared in early advertising publicity and also under the caption of "Electricity as the Motive Force of a Clock" in Harmsworth Popular Sciences, Volume 6 (1913 edition).

Although the word "LECTRICOS" was registered by the Company as a Trademark on the 5th April, 1909, it appears to have only been used as a telegraphic address and never as a trade name for their product.

The appearance of the first clock to be manufactured by the Company caused a great deal of interest. It incorporated several new concepts including the use of enamel covered copper wire in lieu of the more usual double cotton covered variety. The electromagnetic contacts were of interest to the telecommunications service and tests were run on them by Government laboratories. It was through this that B. S. T. Wallace, in his capacity as a technician employed by the Government, had the opportunity to study these clocks. Years later, after a lifetime of observation, he came to write some of the most authorative and accurate technical information to be found on the subject. Apart from publicity releases to the newspapers and a few trade journals little contemporary technical information was ever published concerning either the mode of operation or the necessary information to maintain them. The few books written in the early 1900's and subsequently on the subject of electrical horology generally have either ignored them or repeated the original descriptions which were at variance with models being marketed.

As well as many small outlets it is known that these clocks were sold in England by Mappin and Webb (both in London and Manchester), Harrods of Knightsbridge and Aspreys of Bond Street. Those sold by Aspreys have had the original Eureka Clock Company vitreous enamel dial replaced by a silvered dial bearing their name. Advertisements appeared in the Junior Army and Navy Stores

Catalogues and other firms dealing with Mail Orders. A catalogue was circulated among the retailers by Stockall, Marples & Co. Ltd., of 6, 8, 10 Clerkenwell Road, London, who were at this time acting as the Company's Selling Agent. See Appendix III.

In 1911, Powers took out a further patent (Patent No. 4711) for "Improvements in and relating to Self Winding Clocks". At the time of writing only one known example of a clock of this type is known. A full description and photographs appear on pages 20-31, while the Patent Specification can be found in Appendix I.

In 1912 there was a further issue of Preferred Ordinary Shares to the value of £10,000. Unfortunately for research purposes, as this was a Private Company there had been no obligation to submit Balance Sheets to the Board of Trade, but apparently the Company shortly after this date began to have financial difficulties. If there was any basic fault in the clocks being made it was that they were of too high a standard and therefore were pricing themselves out of the market. In 1909 a Bath Chair could be purchased for £2 9s. 6d., 6 pairs of electro-plated fish knives and forks for 10s. 9d. and a high grade mechanical movement with strike in a Buhl case could be had for £3 15s. 0d. The average weekly wage for a working man was 28s. to 35s. The average price for an Eureka Clock at this time was around £5.

By 1914 the Company was in serious difficulties and with the commencement of the First World War it was decided that they would go into voluntary liquidation. A special Resolution was passed on the 27th July, 1914 and a Liquidator appointed. Since 1912 there had been evidence in the Post Office Directory entries of part of the premises in City Road being sub-let to other small firms and after 1916 there is no trace of the Eureka Clock Company at this address. The Final Winding-Up Meeting was held on the 12th April, 1916. The patent relating to the Eureka clock was allowed to lapse in 1918.

From these facts it is quickly realised that although the life of the Company was eight years, effective production was only carried out for five years. There is evidence of these clocks having been made in Germany but undoubtedly the English Company was both the first and largest production unit.

CHAPTER 2

CASE STYLES AND VARIATIONS IN MOVEMENTS

It is intended in this chapter to describe, illustrate and comment on some of the variations to be found in the Eureka Clock movements and the styles of the cases in which they were marketed. The quality of the latter is exceptionally high. They were most certainly the work of high class casemakers and not merely job lots. It has not been possible to ascertain whether the Company employed casemakers or whether they obtained them from one of the many firms so employed in the Clerkenwell area.

It has not been possible to establish any relationship between dates of manufacture and case styles. The period of production was too short for the influence of changing furnishing fashions to be felt. It would appear from the evidence of contemporary advertisements and the catalogue in Appendix III that the various styles of case were used concurrently. Both sources of reference refute such statements that the short movements on circular metal bases covered with glass shades were the earliest models and that it was only as the manufacturers fully realised the visual appeal of the balance wheel that either dials were skeletonised or tall movements made. It should also be pointed out that the claim that many dials were skeletonised in recent years to enhance prices is entirely erroneous. Anyone who has seen an annular dial will readily see that they were purpose made at the time of manufacture and are radially curved.

The comment could be made that the movements were manufactured by those versed in engineering principles and not those usually employed by clockmakers. The hands were held in place by a screw and not pinned. The rachet, intermediate and centre arbors all pass through the thickness of the front plate and the integral boss, instead of being pivotted in pivot holes. Although the basic parts of the movement were either cast or machine made to set specifications in order to facilitate interchangeability of parts there were a number of minor variations in the finish of the movements as well as "short" (balance wheel behind dial) and "tall" (balance wheel below dial) models. The most commonly found variations are:-

General finish i.e. plates left rough, polished or snailed; wheels crossed or uncrossed
Number of balls in bearing housing i.e. two or three
Number of buffer springs i.e. one or two
Adjustable contact spring
Pinned or nutted backplate
Differing size collet on the balance arbor
Arabic or Roman Numerals
Number of teeth on ratchet wheel i.e. 45 or 40
Optional feature of a seconds dial.

As well as carrying details of manufacturer, patent number and date each movement has a serial number. There were approximately 10,000 numbered movements made and numbering did not commence at an artificially high number. Clocks with higher serial numbers than 10,000 are thought to have been made up from parts sold off when the Company went into voluntary liquidation. The numbering was **NOT** chronological, neither is it possible to dogmatically relate the slight variations mentioned above or the case styles to any specific date. There is no certain way of determining whether any given example is an "early" or "late" example. As the total period of production was only five years this is

not an important point. A great deal of research concerning the subject has been carried out over a number of years and the recently published results of a survey carried out by the Electrical Horology Group of the Antiquarian Horological Society has clearly substantiated previously reached conclusions.

One explanation for this lack of chronological sequence could be that a large number if not all of the basic components were made in one run and these were later finished by individual workers to varying standards with slightly differing details. Numbering could have taken place as movements were sold and not as made. It has only been possible to establish a relationship, and then in some instances only tentatively, between some of these variations and specific bands of numbers.

Examples with the lowest serial numbers	These were of the "short" variety and when used in an enclosed case the dials were frequently skeletonised. The contact spring was adjustable by means of a slot and they had a buffer spring on either side of the contact spring. All of the wheels of the motion work were crossed out.
Examples with serial numbers over 3000	Several changes appeared on these movements—the contacts springs were non-adjustable and only one buffer spring was used. Not all of the wheels of the motion work were necessarily crossed out.
Examples with serial numbers over 7000	These were usually of the "tall" variety. Those with the highest numbers have the dial slightly overlapping the balance wheel. They were usually exceptionally well finished with snailing on the back plate. The appearance of the small subsidiary "seconds" dial is more common on the tall movements and is hence more common on movements bearing high serial numbers.

One curious fact that was well demonstrated by the Electrical Horology Group Survey was that there appears to be two blocks of numbers from which no examples were reported.
Whether clocks bearing these serial numbers were exported en bloc or whether there were two numbering sequences for short and tall movements with a gap between them is not known.

There are also a number of quite fallaceous statements made concerning the number of balls present in the bearing housing. Neither have any dating significance. Research has shown that the appearance of either two or three balls occurs sporadically throughout the entire numbering sequence. Neither should it be said that all models originally had three balls. The original intentions of the manufacturer can be quickly established by examining the bearing housing. There is a small locating pin at the right hand side of the housing in which a locating tab of a steel end plate fits when two balls are used (See Figure 20).

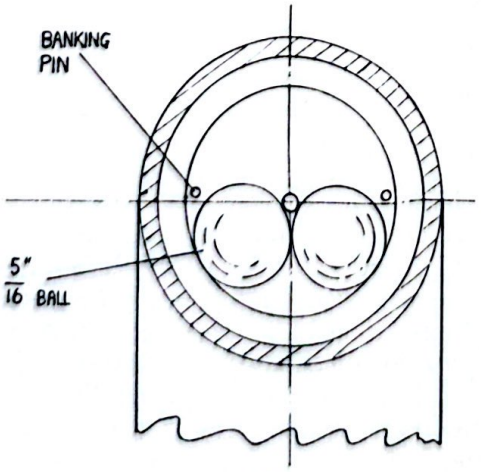
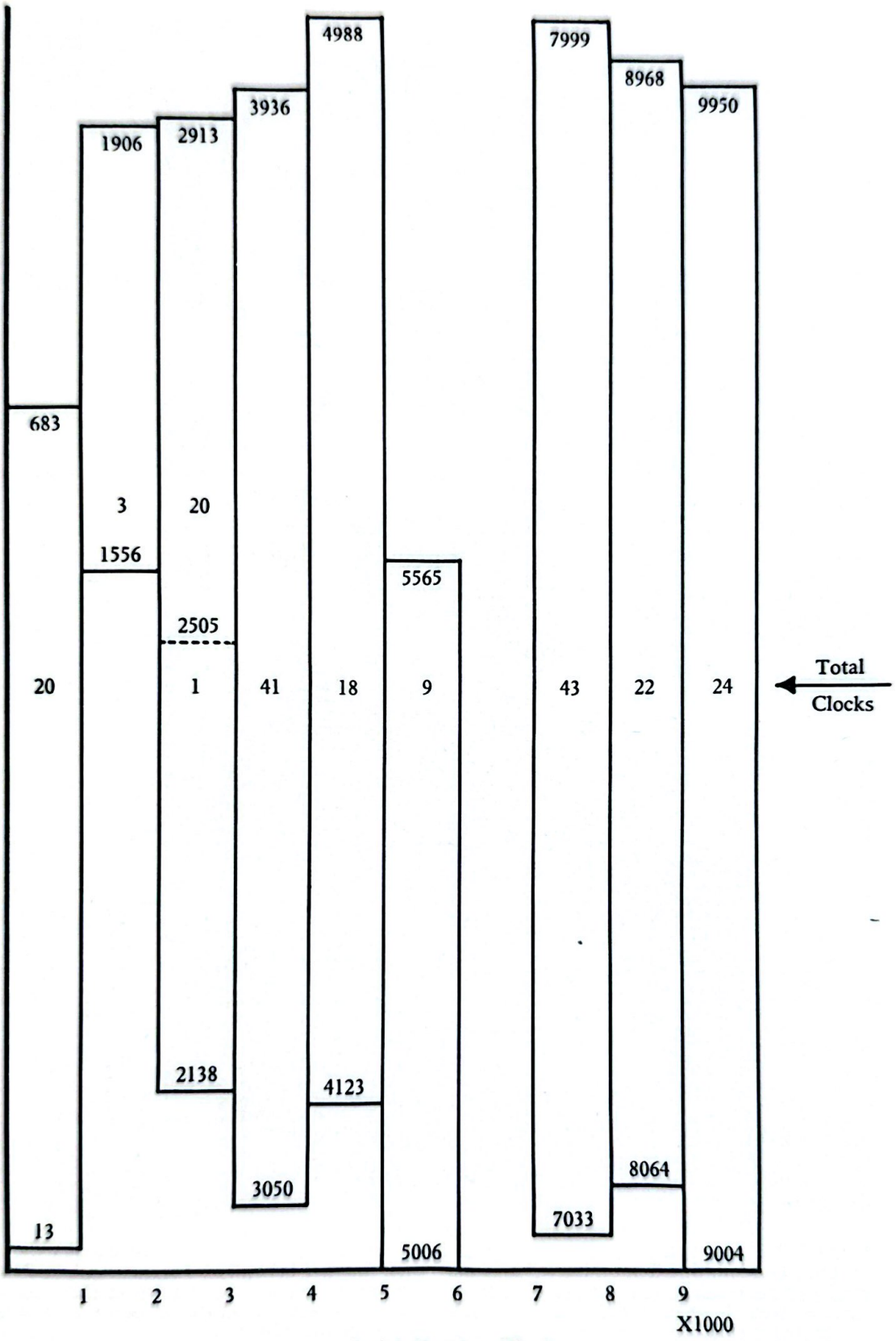


Diagram showing position of balance wheel arbor resting on balls with relative position of banking pins.

by courtesy of Model Engineer



DISTRIBUTION OF RECORDED CLOCKS

Chart

by courtesy of Mr. A. Mitchell.

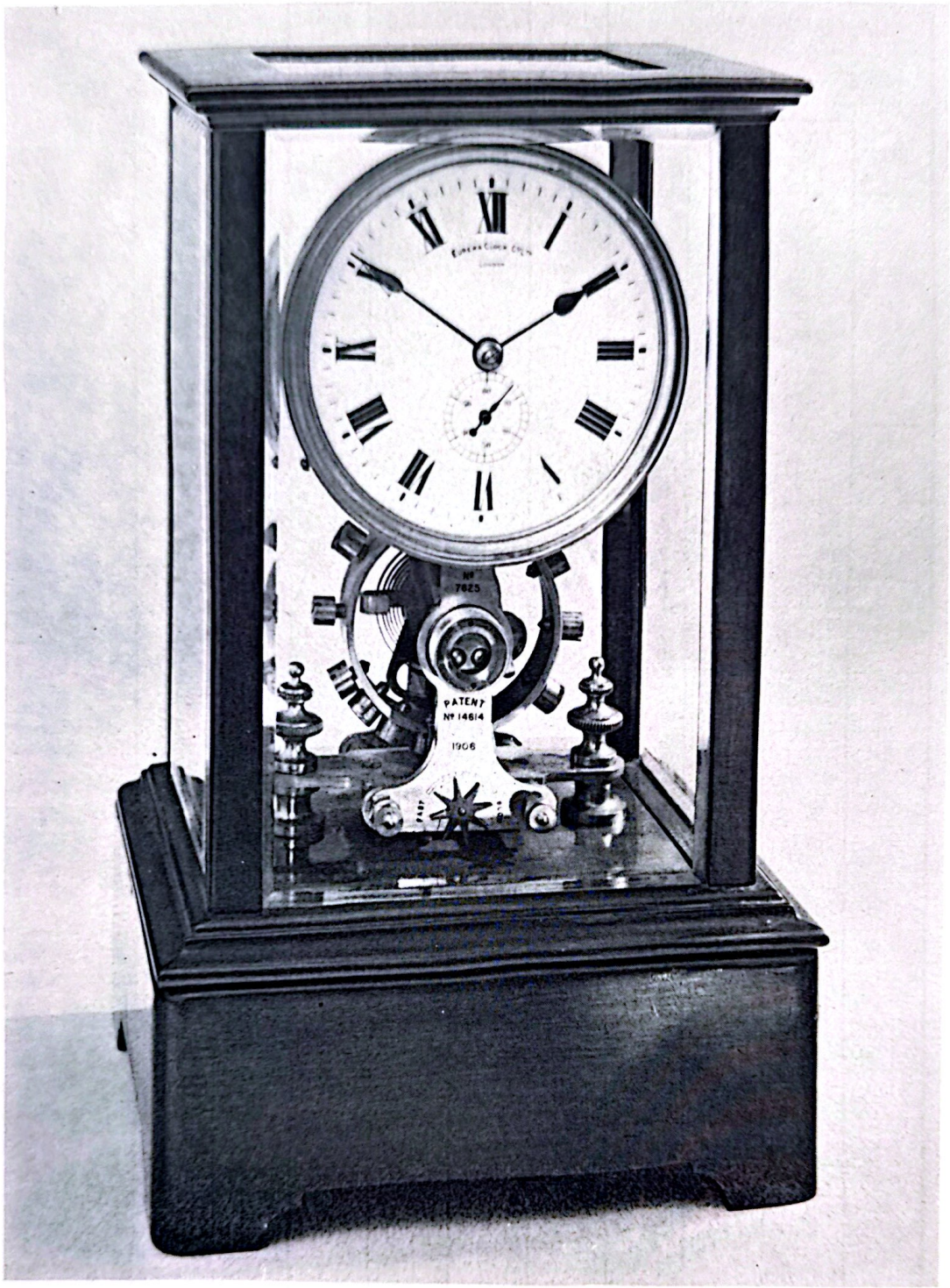


Figure 4

Height 13½in. Mahogany bevelled four glass case. Vitreous enamel dial signed Eureka Clock Co. Ltd., London. Small subsidiary " seconds " dial. Snailed backplate. Patent number, date, serial number, rating star and scale on front plate. Provision for the battery in the base of the case. Not all wheels of the motion work are crossed out. Two balls in bearing housing. One buffer spring. The contact spring has no provision for adjustment.

Serial No. 7625.

Variations noted : Oak bevelled four glass case
Gilt metal bevelled four glass case
Three balls
Minus " seconds " dial
Short movement with skeletonised dial

Figure 5

Height 13in. Brass base with shaped glass shade. Vitreous enamel dial signed Eureka Clock Co. Ltd., London. Small subsidiary " seconds " dial. Plain polished backplate. Patent number, date, serial number, rating star and scale on front plate. Provision for the battery in the base of the case. Two balls in bearing housing. All wheels of motion work crossed out. One buffer spring. The contact spring has no provision for adjustment.

Serial No. 9950

Variations noted : Short movement with skeletonised dial
Three balls
Minus " seconds " dial

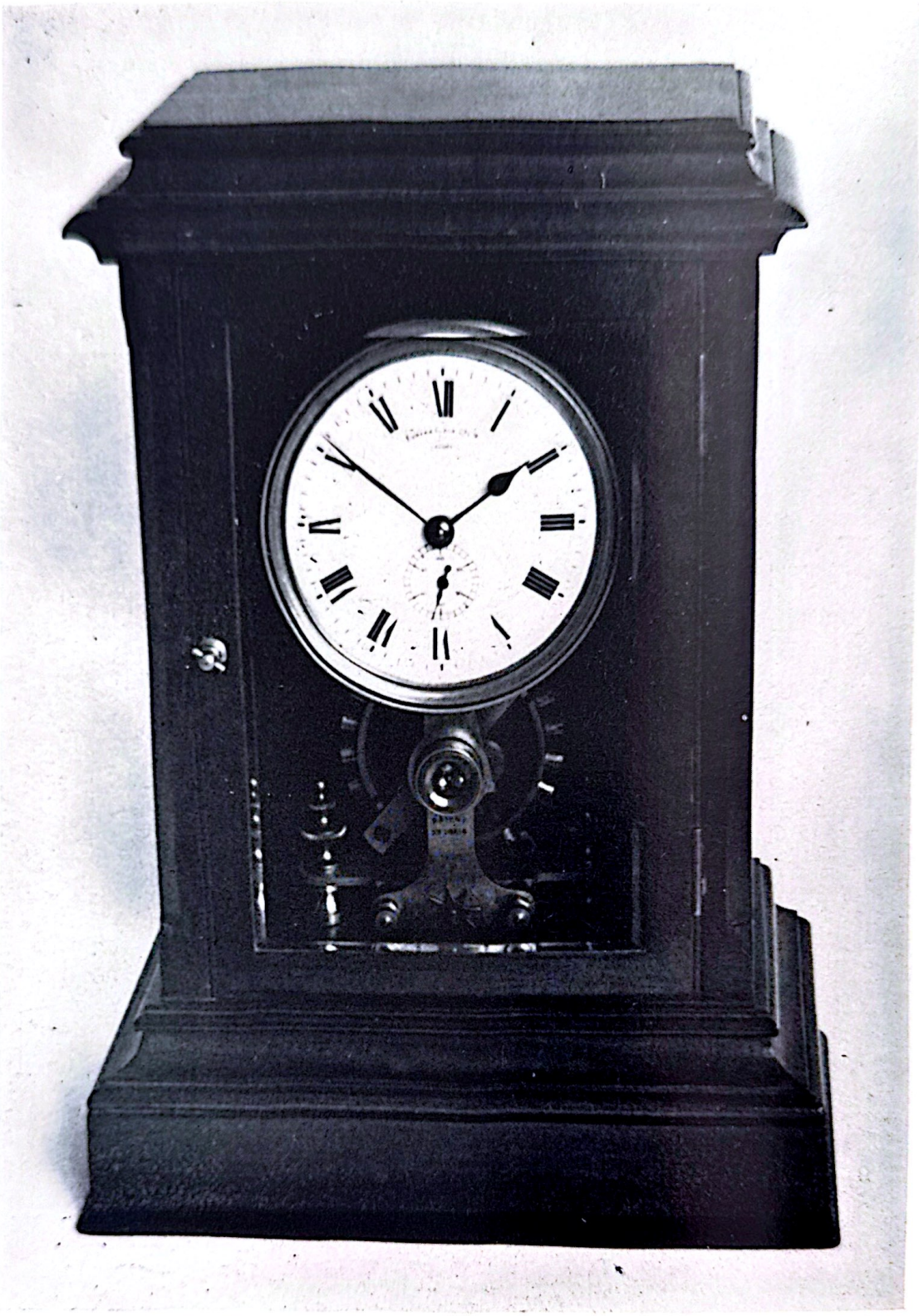


Figure 8

Height 15in. Mahogany case with fully glazed door with bevelled glass at front and solid mahogany door at rear. Vitreous enamel dial signed Eureka Clock Co. Ltd., London. Subsidiary " seconds " dial. Provision for housing the battery is made in the base of the case. Back plate left rough as cast. None of the wheels of the motion work are crossed out. One buffer spring. No provision for adjusting the contact spring. Three balls in the bearing housing.

Serial No. 7191
Variations noted : Oak case
Minus " seconds " dial
Two balls

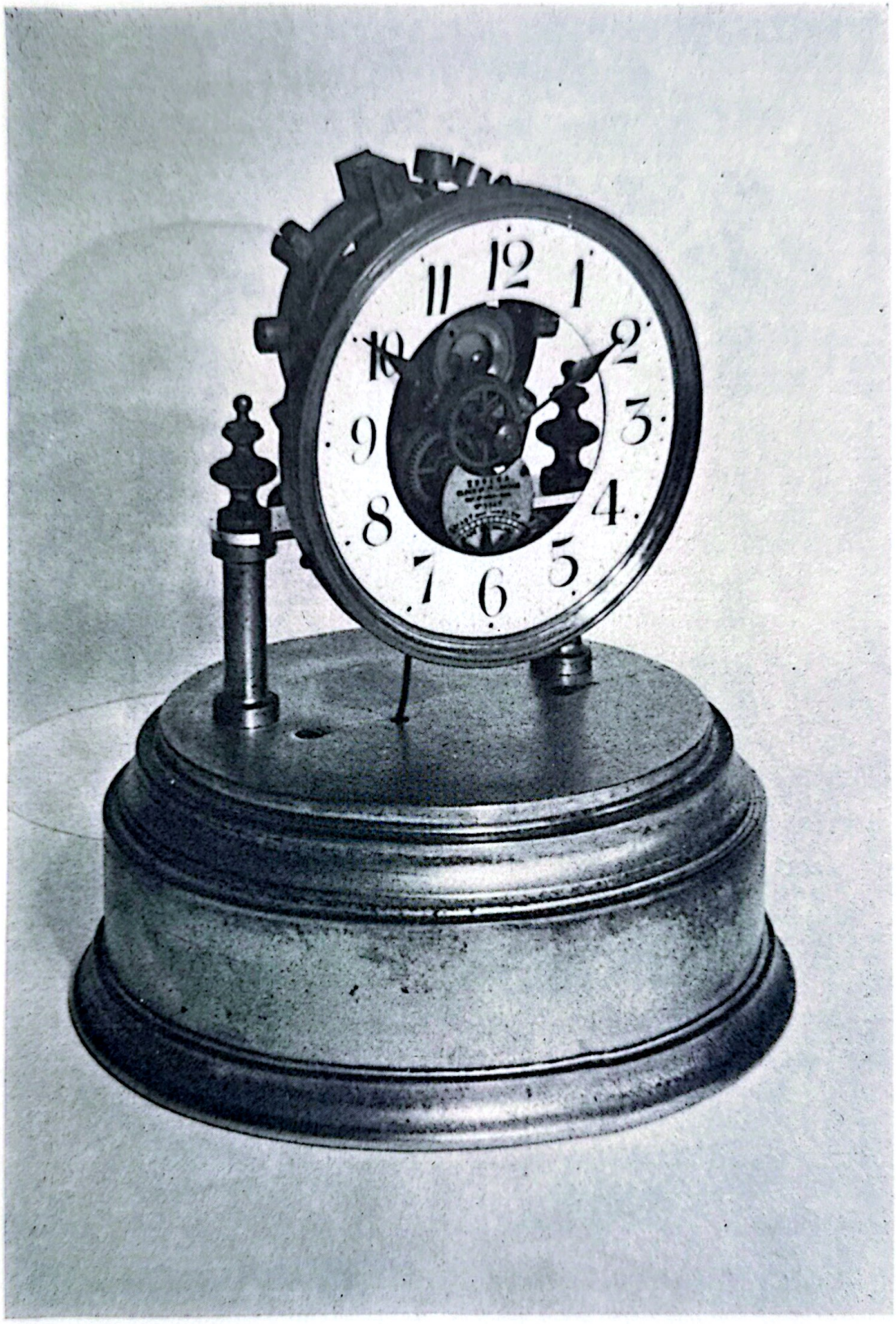


Figure 9

Height 10in. Thin gilt metal circular base with movement covered by glass shade. Skeletonised vitreous enamel dial. Details of manufacturer, patent number, date, rating star and scale on small brass plate visable through centre of dial. Back plate snailed. All of the wheels of the motion work are crossed out. One buffer spring. No provision for adjusting the contact spring. Two balls in the bearing housing.

Serial No. 5565

Variations noted : Tall movement with solid dial and subsidiary " seconds " dial.
Three balls

Figure 10

Height 14½in. Oak four glass case with serpentine shaping to the base and top of the lift off cover and small brass feet. Vitreous enamel dial signed Eureka Co. Ltd., London, followed by the name of the retailer — Finnegans Ltd. of Manchester. Snailed back plate. Patent number, date, rating star and scale on front plate. Provision for the battery in the base of the case. Two balls in the bearing housing. One buffer spring. No provision for adjusting the contact spring. Not all the wheels of the motion work are crossed out.
Serial No. 7395

Figure 11

Height 14in. Mahogany case with stringing, inlay and brass finials and bun feet. Vitreous enamel skeletonised dial. Access to the battery which is housed in the lower trunk of the case and the movement is from the rear. Details of manufacturer, patent number, date rating star and scale appear on a small brass plate on the front of the movement and are visible through the centre of the dial. Three balls in the bearing housing. Short movement. All the wheels of the motion work are crossed out. The back plate is left rough as cast. One buffer spring. No provision for adjusting the contact spring.

Serial No. 3317

Variations noted : Solid vitreous enamel dial signed Eureka Clock Co. Ltd., and 1000 Day Electric Clock added prior to the dial being fired.

The Eureka Clock Company formally registered the design of this case (Registered Design No. 53694) on the 2nd February, 1909.

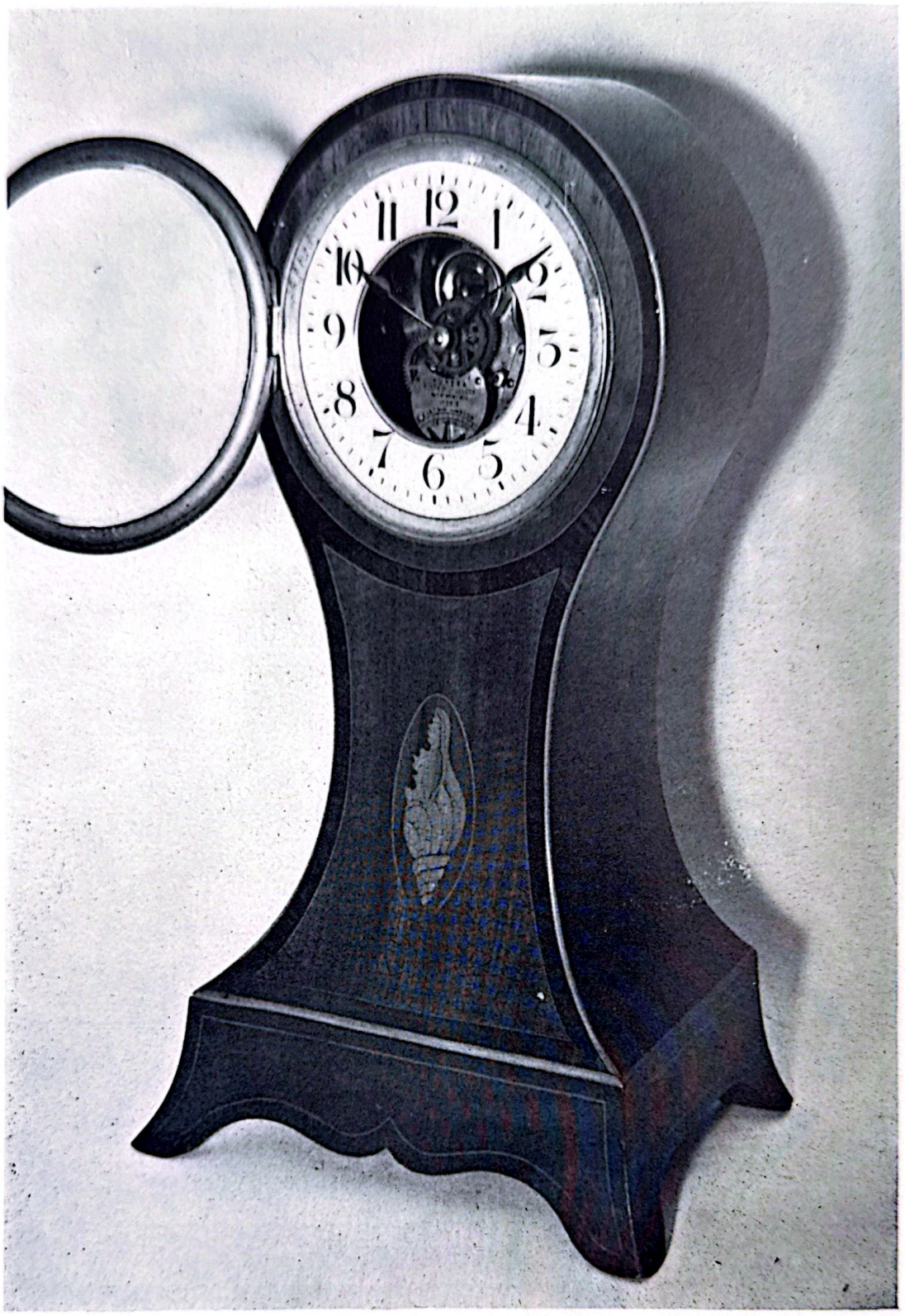


Figure 12

Height 14in. Mahogany Sheraton Balloon Case with stringing and shell pattern inlay. Skeletonised vitreous enamel dial. In this model the name of the Company, patent number, date, rating star and scale appear on the small brass plate visible through the centre of the dial. Access to the battery that is housed in the lower half of the trunk is through a small wooden door, while the movement is approached through a circular aperture at the top. This has a circular brass press fit spun cover. All the wheels of the motion work are crossed out. Short movement. Snailed backplate. One buffer spring. The contact spring has no provision for adjustment. Two balls in the bearing housing.
Serial No. 5515.

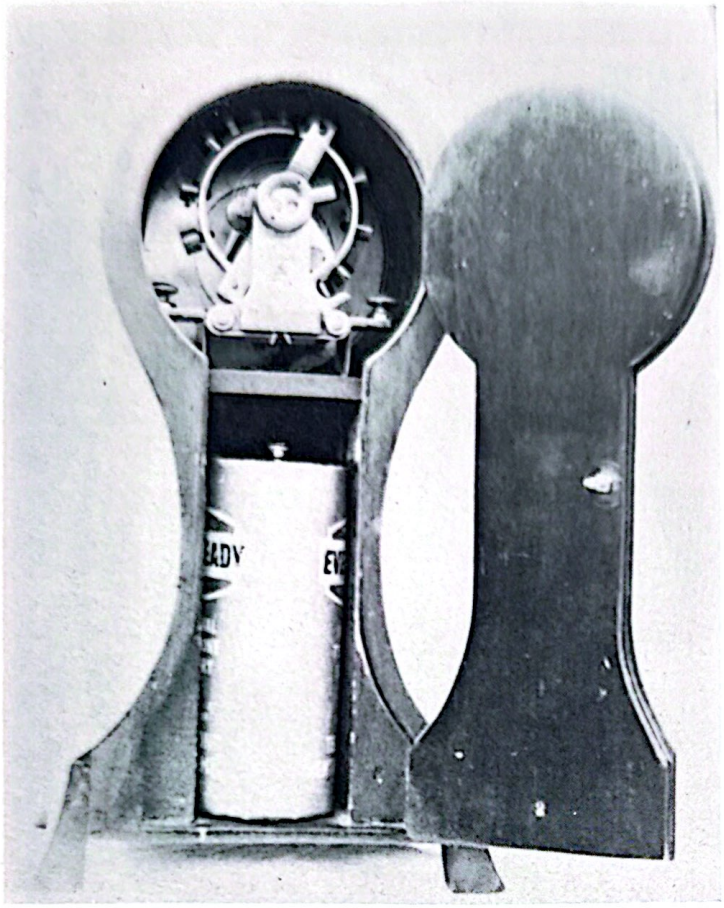


Figure 12a
by courtesy of Mr. A. Mitchell.

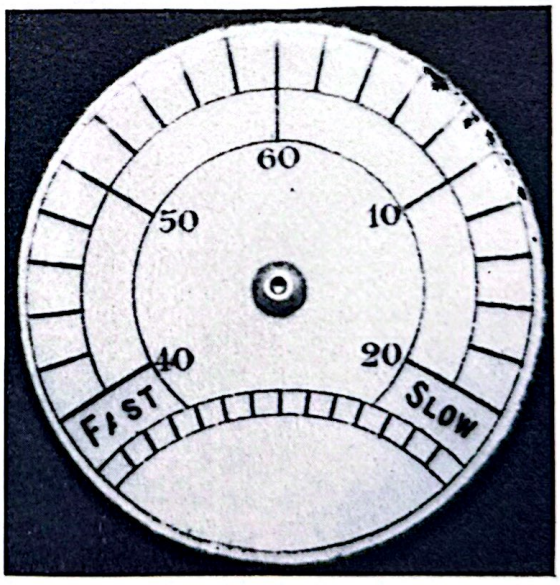


Figure 12b

Variations noted : Solid vitreous enamel dial signed with the name of the Company, but with small brass plate on the backplate.
Three balls.
In place of two separate doors in the rear of the case, a keyhole shape door as seen in Figure 12a.
Similar skeletonised dial but in place of the brass plate with customary details, a small vitreous enamel dial with the upper segment calibrated for seconds and the rating scale below. See Figure 12b.
The last two mentioned variations are extremely rare.

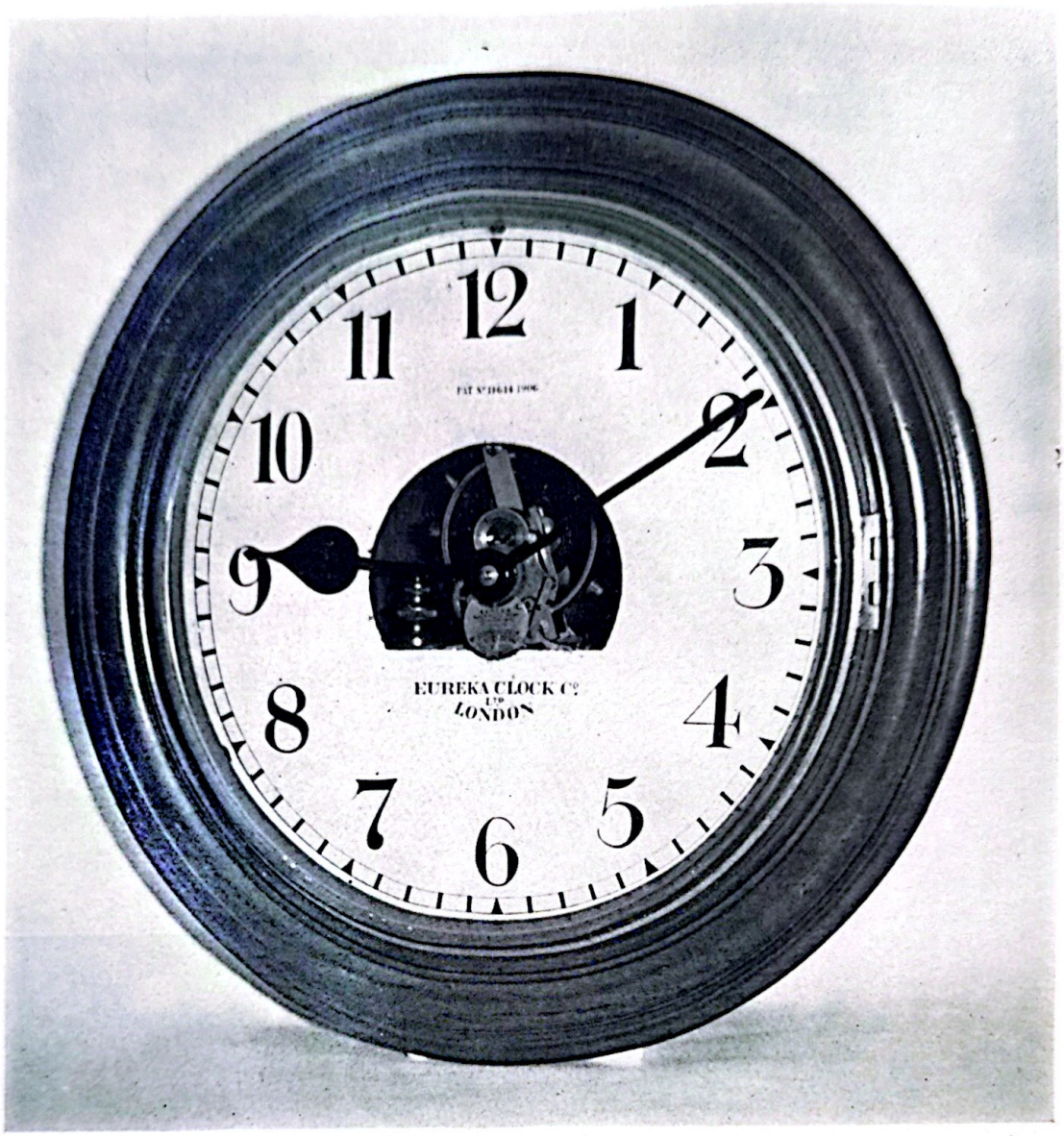


Figure 13

Diameter 14in. Mahogany case. Painted skeletonised enamel dial signed Eureka Clock Co. Ltd., London. The patent number, date are also on the dial as well as appearing on the small brass plate together with the rating star and scale visible through the centre of the dial. Short movement. Snailed backplate. Provision for the battery is made below the movement with access from the side of the case. Two balls in the bearing housing. All the wheels of the motion work are crossed out.

Serial No. 4276

Variations noted : Diameter 12in.

Movement mounted onto back of dial instead of as usually found onto seat board. Possibly an early example with this method proving unsatisfactory as total weight of movement only supported on two screws through the thickness of the dial plate.

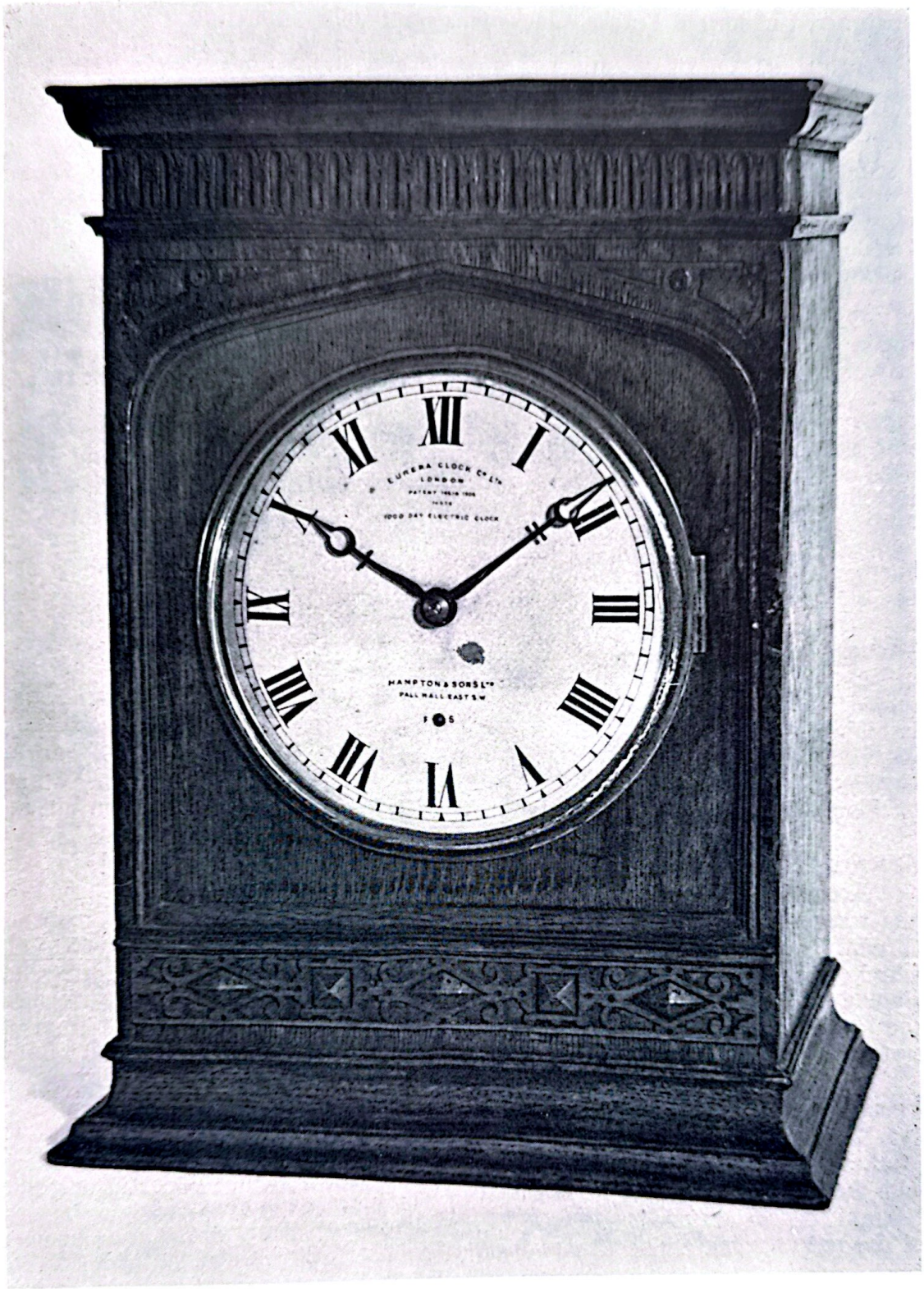


Figure 14

Height 14″. Oak Gothic style case. Six inch painted dial signed Eureka Clock Co. Ltd., Patent No. 14614 1906, followed by the number 14066 and the words 1000 Day Electric Clock. This is an example of a high serial numbered Eureka clock i.e. over 10,000 as discussed on page 22. In the lower segment of the dial there is the retailer's name—Hampton & Sons Ltd., Pall Mall East, S.W. with the Fast/Slow adjustment arbor below. Non-standard hands. Snailed backplate. Short movement. No provision for adjustment on the contact spring. One buffer spring. Two balls in the bearing housing.

Serial No. 4772—this appears on the front plate of the movement.

Variations noted : Case and dial styles vary considerably.

High Serial numbered Eureka Clocks ie. over 10,000

In the light of present evidence it would appear that these clocks were made up of movements sold off when the Eureka Clock Company was wound up in 1916 and cased to individual requirements by the purchaser of the movements. Stories have also been related of boxes of parts being sold from the barrows in Farringdon Road between the two World Wars. Critical inspection of known examples show that they are not recent marriages. For instance the clock illustrated in Figure 14 has an extremely aged and crazed painted dial almost certainly dating from the 1916 era. The inscription on the dial obviously predates the crazing and bears no evidence of having been added at a later period.

Of the examples noted all have short movements, the dials are painted and not of vitreous enamel, the serial number of the clock, maker's name (and/or retailers as may be), and 1000 Day Electric Clock, patent number and date are clearly marked on the dial. All had an aperture in the dial through which the regulator could be adjusted, therefore all had originally been intended for use with skeletonised dials. The cases vary considerably—often far larger than necessary, and not always good quality. The number on the movement is at variance with that appearing on the dial. The possibility has been raised that the Company made these examples up to individual customers' requirements and therefore numbered them out of sequence. In which case why not match the movement number with that appearing on the dial? An example of one of these clocks can be seen in Figure 14.

Striking Eureka (not illustrated)

Only one known example recorded. Rectangular wooden base with glass shade. Short movement. Skeletonised dial. Exhibited at the Pendulum to Atom Exhibition held in 1958 (see page 67 of the catalogue), and again at the Electrifying Time Exhibition held from December, 1976 to April, 1977 (see page 30 of the catalogue). It has not been possible to trace any contemporary documentation of this particular model.

American Eureka (not illustrated)

According to comments made by Henry Fried, the Forestville Clock Company had a model of the Eureka Clock that had a transformer to take 115V, 60 A.C. current. The balance wheel appeared to be solid due to brass plates covering the wheel crossings, but if this was removed it then had the same appearance of other Eureka Clock balances. He went on to say that " the contact was in the form of the traditional lever fork, one side of which was insulated, similar to the Bulle system ... about 1935 such clocks were imported into " the United States.

French Eureka (not illustrated)

A mahogany Sheraton Balloon cased example was seen at the Bermondsey Market, London by the author in 1974. The movement was a standard model but with the small brass plate on the back of the movement engraved "Marque Depose 'Acme', No. 17, Patent No. 367856 1906". The latter being the date and number of the patent taken out in France by the Eureka Clock Company.

German Eureka

Following an Extraordinary General Meeting of the Eureka Clock Company on the 7th December, 1909, Sigismund Kutnow was given the authority to sell at his discretion the Patent Rights of the Patents taken out abroad. He was to receive 25% of the proceeds from any such transactions with the balance going to the Company. There is little doubt that he sold the Rights to the German Patent. Although only a handful of examples have been noted in this country it is obvious that these were part of a production run that bore no relation to that of the Eureka Clock Company in this country. Unlike the English Eureka these were

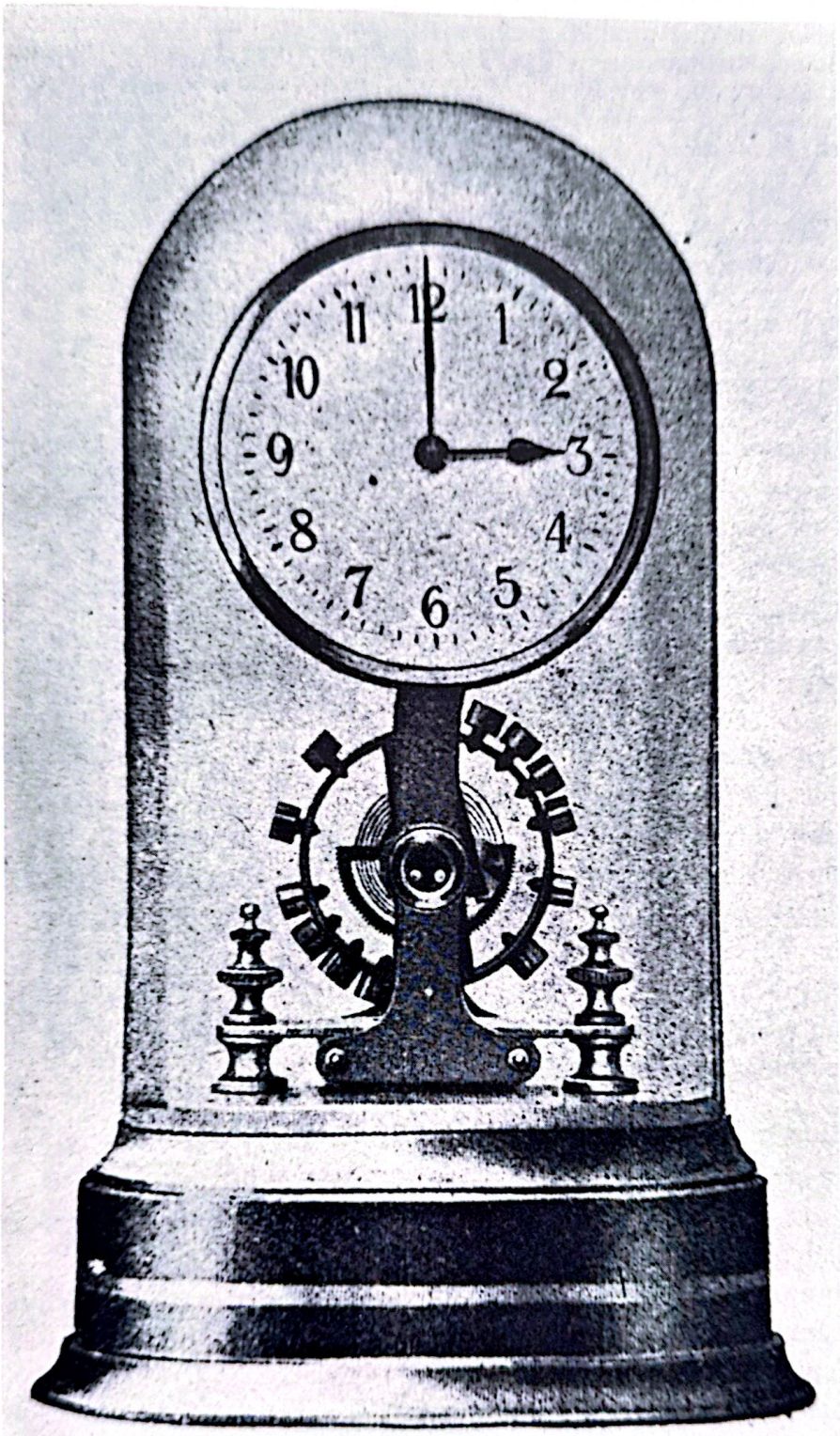


Abb. 23
Stutzuhr Eureka Clock Co.

Figure 15

Illustration of German made Eureka Clock as it appeared in the Deutsche Uhrmacher-Zeitung No. 1, 1911. Advertisements offering identical models were still appearing in Die Uhrmacher-Woche in 1923.

made to clockmaking principles of manufacture and one is tempted to speculate as to whether this was one of the German firms making the 400 day clocks at that time. As can be seen from the illustration that appears in the book entitled Electrotechnick fur Uhrmacher by Zacharias (published in 1920) and is said to have been from the German journal Deutsche Uhrmacher-Zeitung of 1911 the style of casing was identical. See Figure 15.

The text and diagram however accompanying this illustration in Zacharias is of the English Eureka! Zacharias goes on to say that the firm of A. Wertheim were marketing these clocks in Berlin. It has not been possible to establish the exact nature of Wertheim's business but there is today a large departmental store of that name in Hamburg. There are a number of differences between the German-made movements and those made by the Eureka Clock Company in Clerkenwell.

German Eureka

No cast parts
Housing to the bearings screwed to front and back plates
Dial plates thin
Black enamel wire to the coil
Pillars between back and front plates not recessed to take base plate
Brass outer rim of balance only 1/16th thick
Balance is not compensated i.e. brass only
No brass plate with serial numbers etc. Whether number on balance wheel had any significance is not certain
Alternatively this information does not appear on front or back plate
Rating on back plate indicated by arrows and A or R
Hair spring stud above centre
Dials thin and either silvered or painted
Arbors on pivots
Regulation is by a semi-circular (D-shaped) sector
Adequate but not a high standard of finish

English Eureka

Some cast parts
Housing cast with plates
Sturdy dial plates
Usually brown enamel wire to coil
Pillars recessed to take base plate
Balance appears to be compensated although in fact it is not
Brass plate with details of manufacturer, serial number of movement etc.
Alternatively this information appears on front or back plate
Rating star has accompanying scale indicating Fast or Slow appears in same location as details of manufacturers etc.
Hair spring stud below centre
Vitreous enamel
Arbors pass through front plate
Regulation is by a triangular shaped sector
Exceptionally high standard of finish

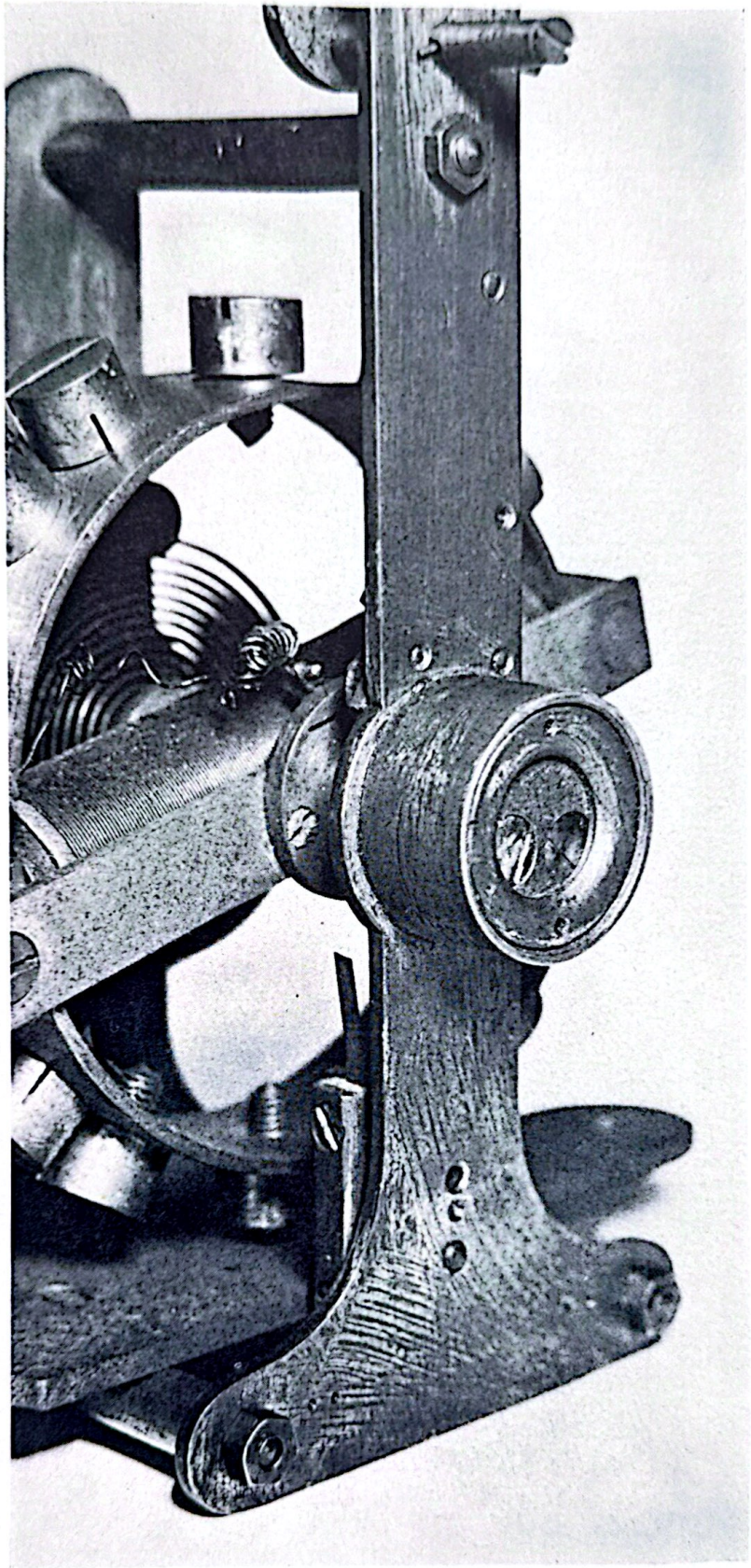


Figure 15a

Close-up view of an unrestored German Eureka movement. This particular example had two balls, one buffer spring, and provision for adjusting the contact spring. The number 112 appeared on the balance otherwise there were no identifying names or marks.

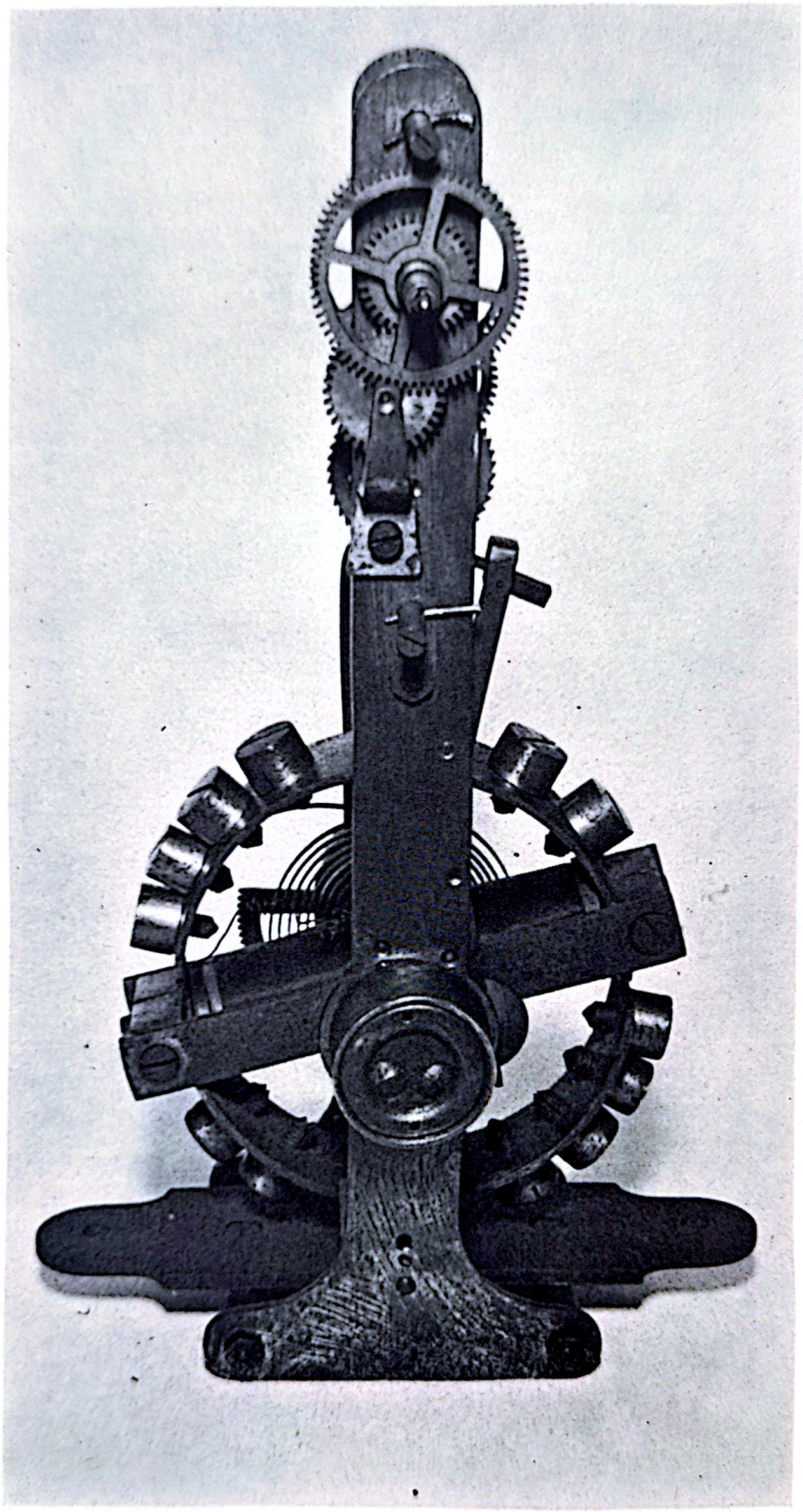


Figure 15b

Front view of the same German Eureka movement.

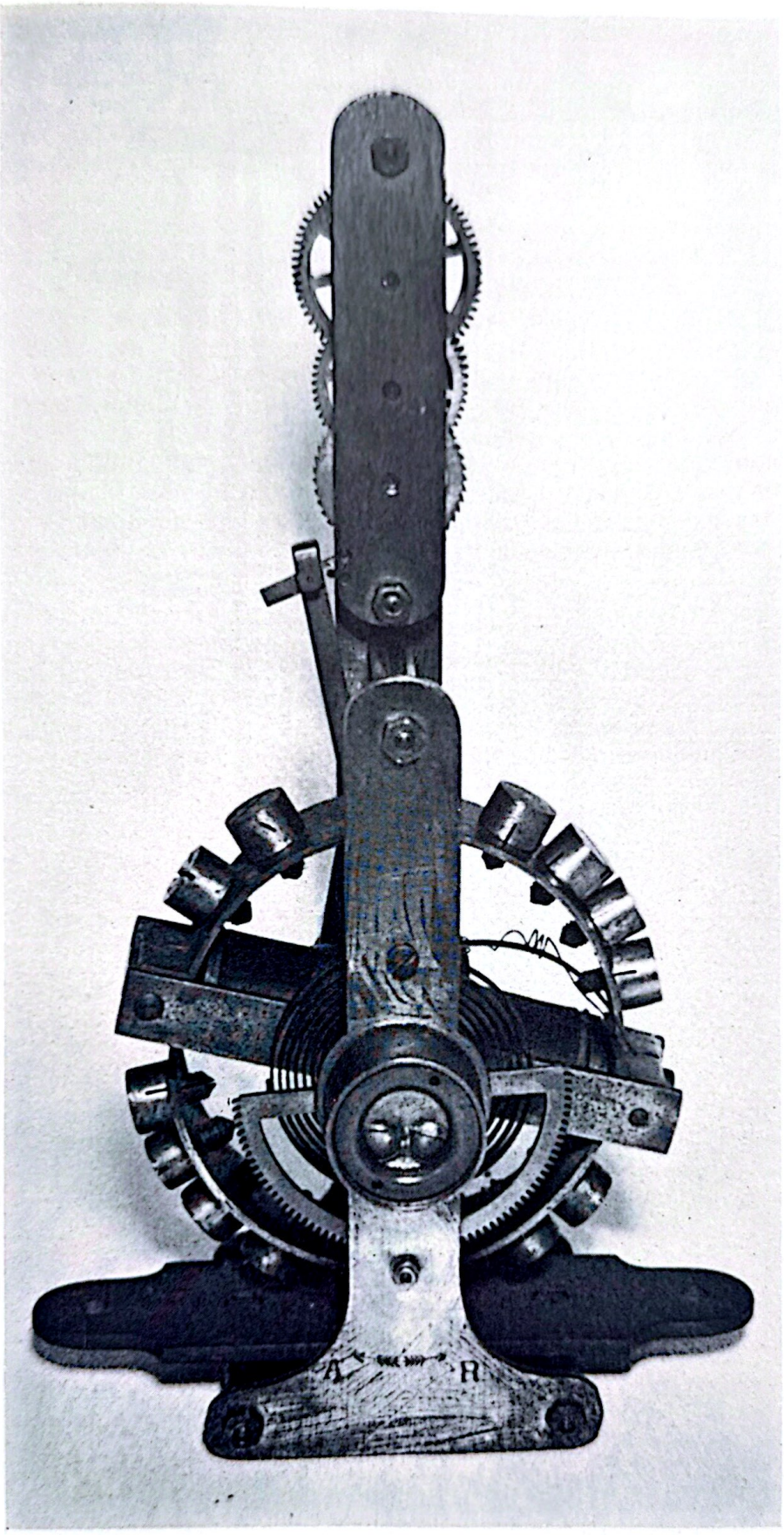


Figure 15c

Back view in which can be seen the characteristic D shaped sector for regulating.

Figure 16

Height 10in. Mahogany case with some stringing and small brass feet, stamped "Made in England". Fully glazed door with bevelled glass at the front and solid mahogany door at rear. Provision is made for the battery in the lower half of the case with access from the back. The dial is white vitreous enamel with a decorative bezel. The section of the movement containing the motor, coils, etc. is cast brass. There are no dates, names or serial numbers on either the dial or the movement.

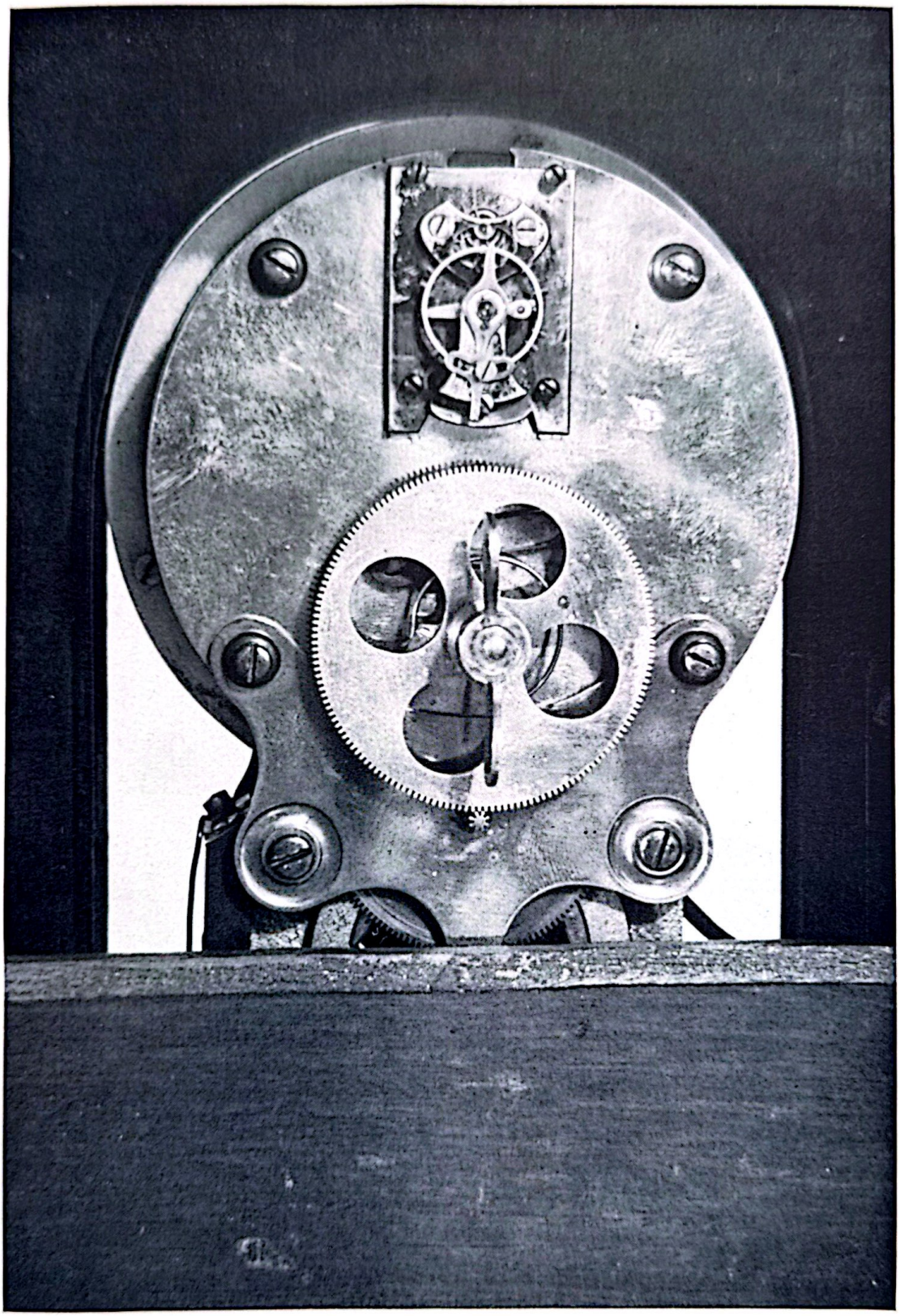


Figure 16a

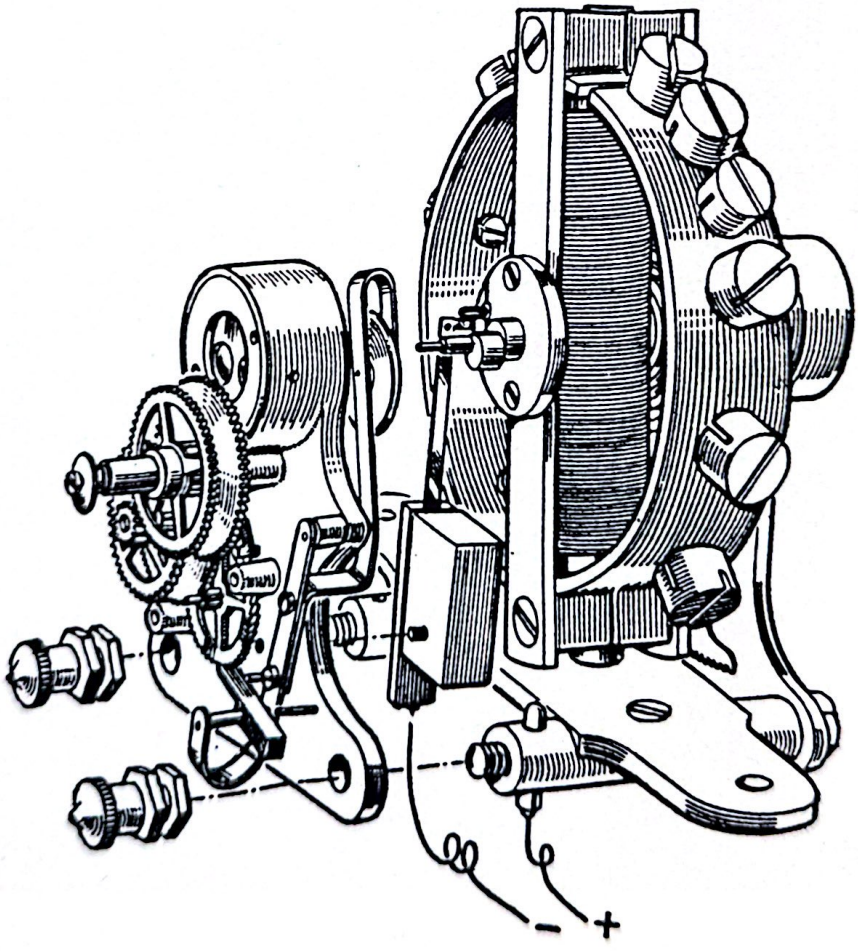
Rear view of the movement demonstrating the good quality eleven jewelled platform escapement. The turn button is to allow for the clock being wound by hand if so desired.

CHAPTER 3

TECHNICAL DETAILS FOLLOWED BY SOME SERVICING HINTS

Essentially the Eureka clock consists of a large electrically maintained balance wheel running in ball bearings which provides the power to the wheel train. Figure 17 shows an exploded view of the short movement i.e. balance wheel behind the dial; Figure 18 shows a tall movement i.e. balance wheel mounted below the dial.

Diametrically across the balance wheel lies an electromagnet with two strips of soft iron taking the place of the balance arm. They enclose the coil and at the same time decrease the magnetic reluctance. The balance spring collet is secured to the back arbor and the front arbor carries a contact pin. The front and back plates are separated by two brass pillars. The soft iron armature is screwed to their base. The centre part of the armature is cut away slightly to radius concentric with that of the balance wheel and, when assembled, the pole pieces of the energising coil which protrude through the clamps on the balance wheel rim just clear this radiused part of the armature. An insulating block



by courtesy of the British Horological Institute.

Figure 17

"Short" movement i.e. Dial in front of Balance Wheel.

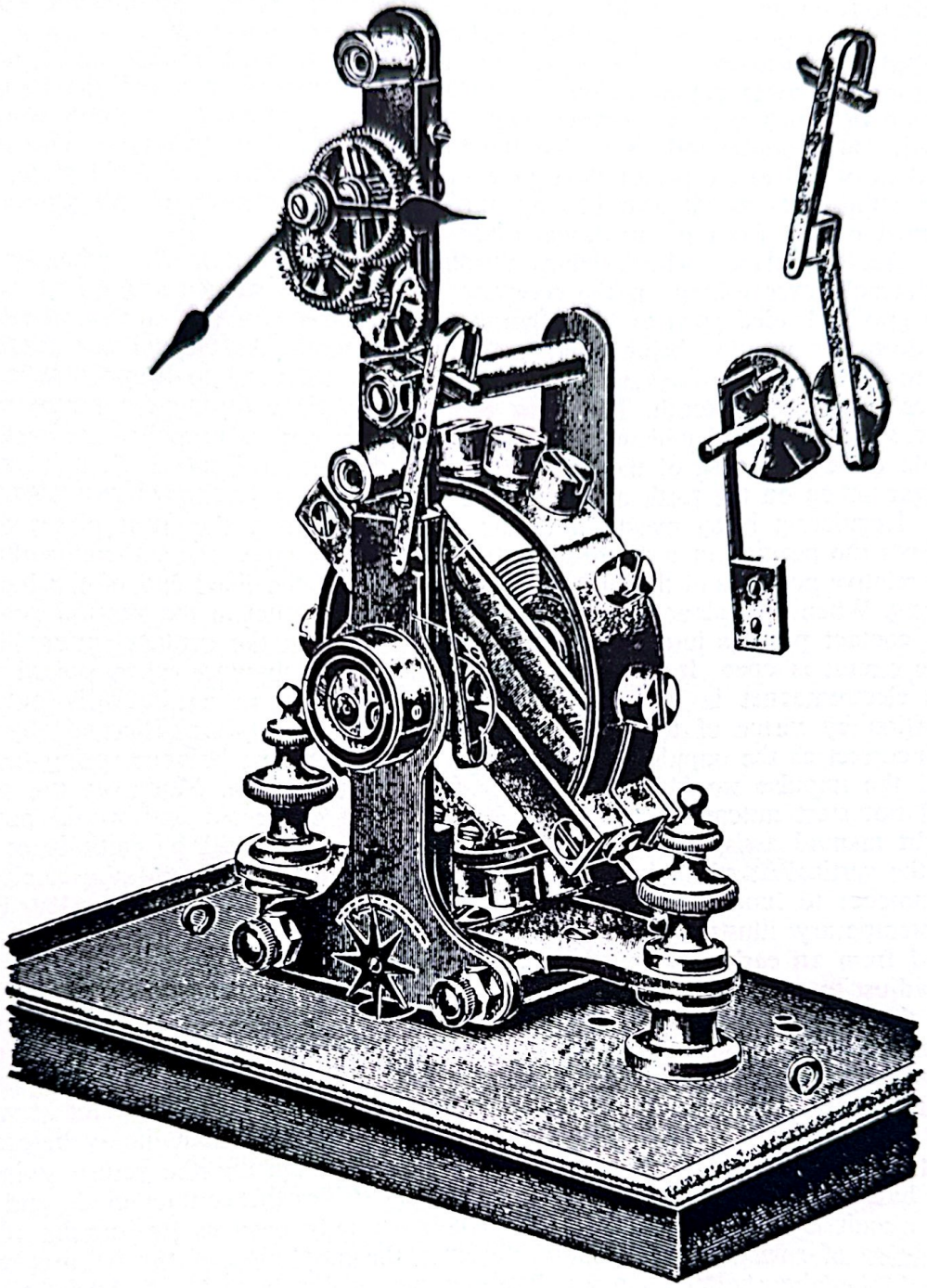


Figure 18

" Tall " movement i.e. Dial above Balance Wheel.

securely fastened to the back of the front plate carries a spring which terminates at its upper extremity in a contact which, when correctly adjusted, lies in the path of the contact pin as it is carried round by the balance wheel. The wiring goes from the negative terminal of the battery to this contact spring. From the positive terminal of the battery the wiring passes via the balance spring and pivot through the coil to the contact pin on the balance wheel.

A bell crank lever is attached to the front plate, the one end of which carries a roller (the upper end in a short movement and the lower end in a tall movement).

This rolls on an eccentric fitted to the front balance arbor. The opposite end of this lever carries a gravity loaded pawl, the limit of movement of which is controlled by two banking pins. This pawl acts on a 45 tooth rachet wheel, which carries an 8 tooth pinion acting on an 80 tooth intermediate wheel, the 10 tooth pinion of which acts on another 60 tooth wheel to which the cannon wheel is fixed. The motion work is of the normal two stage reduction type. The intermediate wheel arbor passes through a boss on the back of the front plate. The arbor thus acts as its own bearing surface. The minute wheel and pinion are carried on the front of the same arbor.

As the balance wheel swings through the zero position the roller on the bell crank lever rolling on the eccentric on the front balance arbor first causes the gravity loaded pawl to be withdrawn from a tooth of the ratchet wheel and to drop into position behind the next following tooth. As the balance continues to rotate the roller following the eccentric causes the pawl to propel the ratchet wheel forward one tooth. The same action takes place during the return swing of the balance wheel and in this way the ratchet wheel is propelled forward one tooth for every swing of the balance in **both** directions of travel. A light spring detent acting on the teeth of the ratchet wheel prevents backward movement.

Regulating is by means of a star wheel in front of the front plate, which adjusts the position of a toothed sector affixed to the back plate, thereby altering the relative positions of the curb pins on the sector to the fixed end of the balance spring. When the balance is at rest with the electromagnet in the vertical position the contact pin has just been freed from contact with the contact spring blade. The circuit is open. It is generally accepted that the balance when poised with the electromagnet in the vertical position is at its most aesthetically pleasing position by virtue of the symmetry of its oscillating motion. Theoretically this is incorrect as the impulse given then has to overcome the balance spring tension and the impulse would not be given at the zero position. Moreover the clock will not start automatically on the battery being connected and would require slight manual assistance. Correctly the electromagnet should be initially at 30° to the vertical at which position the contacts are just closing and the clock will commence to function upon the battery being connected. (See Figure 19). From contemporary illustrations it would appear that the alternative positions were used from an early date by the manufacturers themselves. It is a simple matter to adjust to either. All that is necessary is to release the small 14BA screw holding the balance spring collet, re-position the balance and tighten the screw gently. From either position a slight swing of the balance wheel is sufficient to complete the circuit and when contact is established the projecting pole piece of the coil is pulled gently downwards until the contact pin clears the spring contact at which instant the circuit is broken. The magnetic field collapses immediately before the vertical position is achieved by the electromagnets. During the return swing of the balance wheel the insulated side of the pin strikes the contact blade and thus the circuit is not closed. The balance therefore only receives its impulse in one direction of swing. For maximum efficiency the amplitude of the balance wheel should be almost 360°. An amplitude of less indicates a fault. The period of oscillation is normally $2\frac{1}{2}$ seconds or 45 swings of the balance per minute. There are a few exceptions in which the period of oscillation is 3 seconds and the number of swings 40, in which case the ratchet wheel has 40 teeth. The small subsidiary "seconds" dial on some models does not truely indicate seconds but is more in the nature of a motion dial indicating that the teeth are being correctly notched up on the ratchet wheel. Therefore this will also either rotate in either 45 or 40 steps.

In a model with 40 tooth ratchet

$\frac{1}{2}$ oscillation (1 swing) takes $1\frac{1}{2}$ seconds in 360° swing.

Therefore the maximum theorectical duration of contact is $1\frac{1}{2} \times 30/360$

$= 3/2 \times 30/360 = 1/8$ second.

In a model with 45 tooth ratchet

$\frac{1}{2}$ oscillation (1 swing) takes $1\frac{1}{3} \times 30/360$

$= 4/3 \times 30/360 = 1/9$ second.

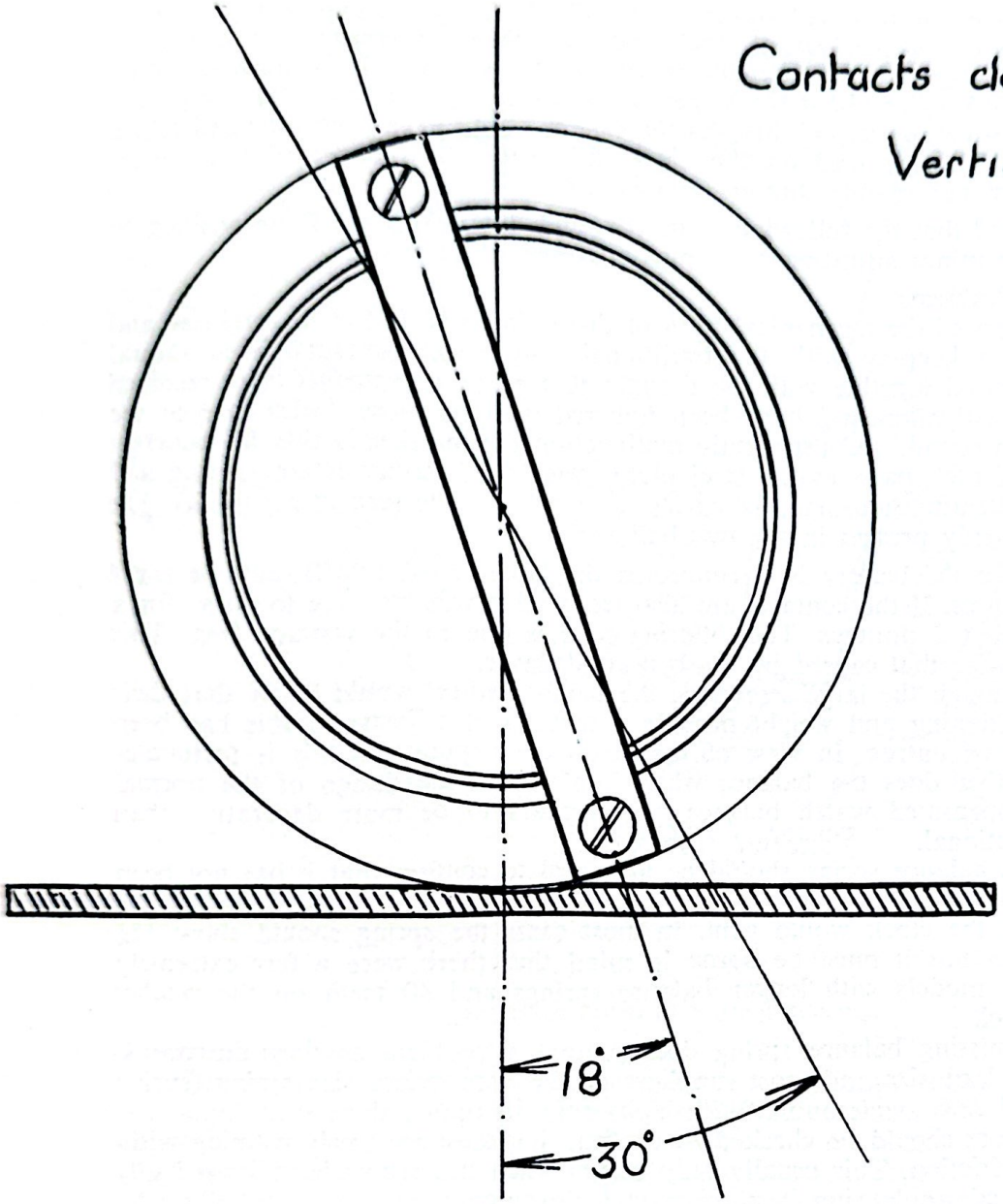


Figure 19

Because electromagnet has inductance causing some delay in current reaching maximum after the contacts close it is necessary for the contact to close a little before the electromagnet reaches the operative position.
N.B. But must switch off immediately before the vertical so is actually slightly less. Takes 10 mille seconds for magnetic flux to decay after contacts open.
The smaller the amplitude the longer the contacts are closed which causes increased demand on the battery.
For an analysis and measurement see notes by C. K. Aked in the Horological Journal for September, 1977 p.44. The figures given here were approximately 60 mille seconds which equals 1/10 second.

The likely problems to be met with in the Eureka Clock can be divided into those of a mechanical nature and those relating to the electrical side of the movement. Although most of these faults are relatively simple to rectify they can be difficult if not impossible for those without engineering skills or access to a workshop. There are few repairers who are prepared to undertake their restoration for

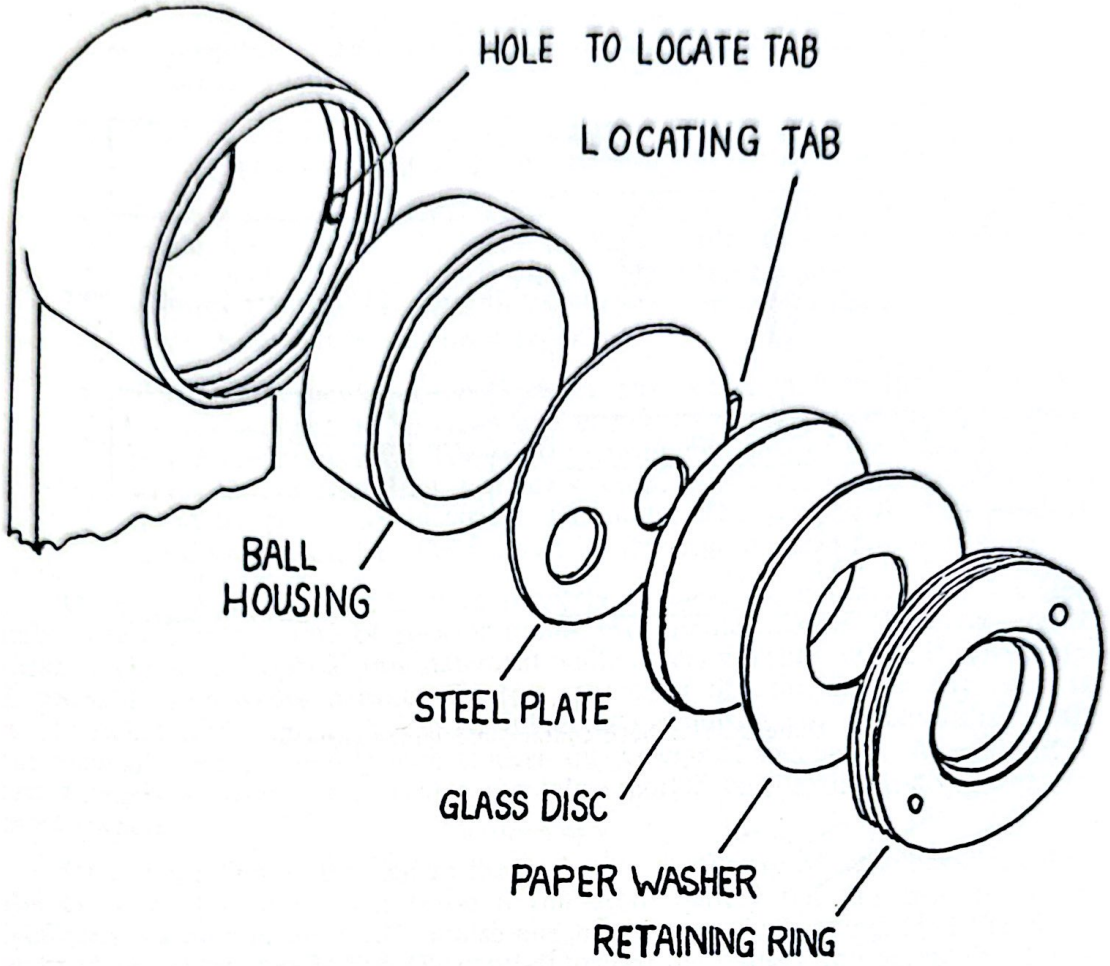
the same reasons as their colleagues in the 1900's. They are experienced men in the principles of the mechanical clock and are either not prepared or unable to cope with the vagaries of electricity as applied to horology. It is therefore often sensible to think twice about the vendor's reassuring " It's only a simple repair—any handyman can do it!" If this was the case it would have been executed and a higher asking price placed on the clock. Similarly glass shades of the correct dimension are not readily and/or cheaply obtained.

It is hoped that the following comments and data will assist those wishing to undertake the minor adjustments or repairs commonly met with.

Mechanical Problems

The design of the mechanical train of these clocks is that of an engineer and not entirely in keeping with the traditional horological concepts. This should be borne in mind together with the thought that many movements have received untutored investigation and have been tinkered with by those " who love to see the wheels go round ". Consequently malfunction can be simply due to incorrect reassembly of such parts as the steel plate, glass disc, washer retaining ring and so on in the bearing housing. The correct assembly can be seen in Figure 20. The steel plate is only present in the two ball variety.

1. When the battery is disconnected the balance wheel will oscillate for 4 minutes. If the contacts are also removed it will continue to do so for a further 2 minutes. The differing time is due to the contact drag. This is twice that caused by the bell crank lever.
2. Although the large screws on the balance wheel would imply that their positioning and weight provide a method of adjustment this has been proved untrue. In view of the possible computations this is fortunate! Neither does the balance wheel conform to the design of the normal compensated watch balance and appears to be more decorative than functional.
3. The balance spring should be inspected to confirm that it has not been broken at some date and pinned up short. The effect of this would be that the clock would gain. In most cases the spring should show 12¼ turns but it must be borne in mind that there were a few extremely rare models with longer balance springs and 40 teeth on the ratchet wheel.
4. A missing balance spring does present a problem as they are not of standard size and most suppliers of the appropriate size spring (spring steel .096″ wide and 0.015″ thick) only fill bulk orders.
5. Arbors should be checked to confirm that they are freely rotating without friction. This usually only occurs when the arbors have been badly pinned up leaving insufficient end clearance.
6. The detent spring and detent should be examined to ascertain that it is correctly adjusted to notch up one tooth on the ratchet wheel with ease at every 180° turn of the balance wheel. It must be realised that the failure of one tooth in fifty to notch up results in a loss in timekeeping of one hour in twenty-four.
7. It is rare to find the bearing housing or pivots worn but it has been seen on several occasions. It is more common to find the glass end plates worn and pitted. These can be reversed so that the outer polished surface presents itself to the balls.
8. The oil in the bearing housing may have thickened and need changing. This can be replaced and the balls cleaned and returned.
9. The omission of the paper washer between the retaining ring and the glass disc of the bearing housing causes an alteration to the end clearance of the balance and therefore leads to friction. This can easily be replaced.
10. The banking pins in the bearing housing should be left untouched at their original slightly uptilted position. Any temptation to straighten them should be resisted.



by courtesy of Model Engineer.

Figure 20
Correct assembly of bearing housing.

Electrical Problems

The English Eureka Clock was designed to work from a single 1½ volt battery and anything stronger will undoubtedly damage the contracts. The correct battery for a German Eureka is 3 volts. It is as well to be wary of any examples needing a stronger battery as apart from damage to the contacts it could have a multiplicity of faults that have necessitated the use of a more powerful driving force.

1. The possibility of a faulty battery or of a poor connection to the move- should not be overlooked.
2. The impulse should not be given when the electromagnet is at 30° to the vertical. See Figure 19. It should cease immediately before reaching the vertical position. This cannot take place if:-
   a) the contacts are contaminated with oil or dirt. This can be readily removed by carbon tetrachloride on a clean brush.
   b) The flag of the contact spring has become worn and narrow. In some cases it is possible to turn the old silver contact by punching out the rivets holding it in place and after drilling holes in the worn part, turn the contact through 90° and re-rivet it. It is however much easier to rivet a new piece of silver in place and then finally shape it to size. See Figure 21. The outer edge of the flag must be bevelled top and bottom to give the necessary lead in and the faces smoothed. Some contact springs have slots in the lower end to allow for a measure of adjustment but the majority were fixed.
   c) The contact pin is worn and has lost some degree of insulation. The original design for the contact pin is shown in Fig. 22. An alternative

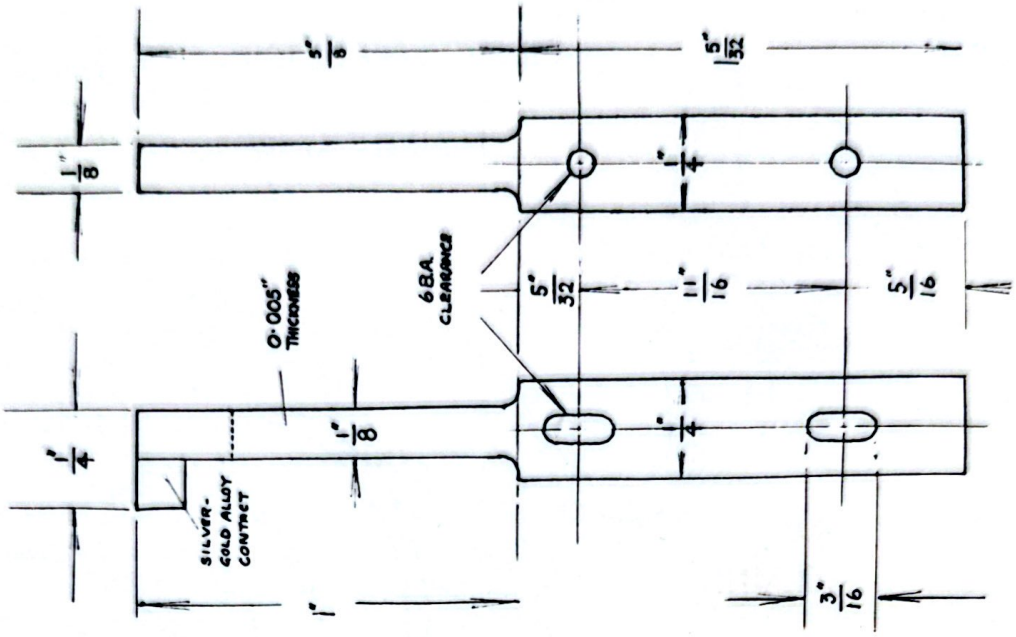
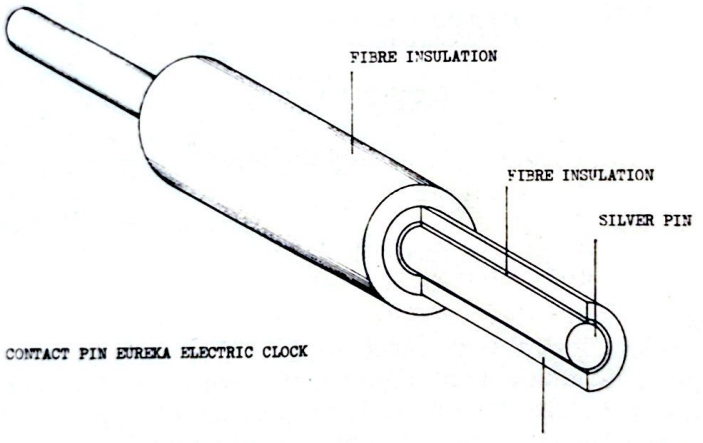


Figure 21
Dimension of both contact and buffer springs.



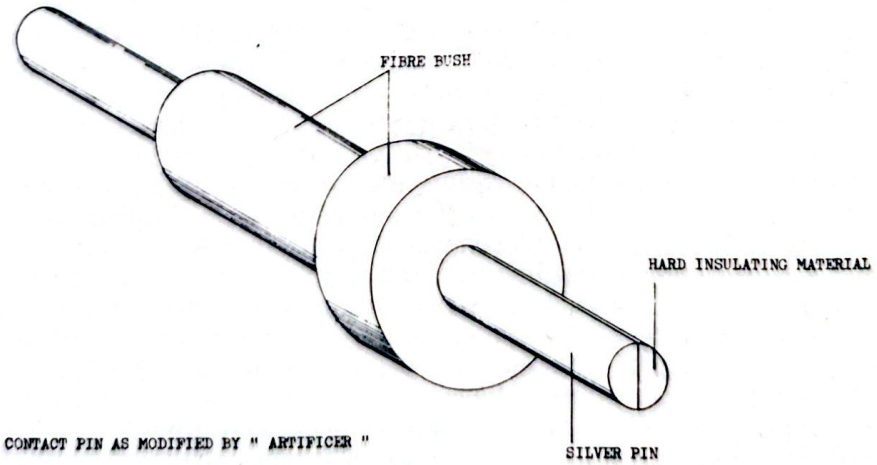


Figure 22

satisfactory design as appeared in the series of articles entitled "The 'Eureka' Electric Clock' by "Artificer" in the Model Engineer during 1949 can also been seen in Figure 22.

3. The contact pressure must be adjusted to give the greater pressure on the active side rather than the inactive (insulated) side. See Figure 23.

4. The air gap between the armature and the electromagnet should only be the thickness of a cigarette paper. In order to ensure this gap being maintained correctly brass shims were placed under the ends of the armatures by the manufacturers. In some instances these have mysteriously disappeared and need replacing.

5. The circuit should be checked for any points of high impedence. All connections should be clean and in particular the buffer spring adjacent to the contact spring. The contact spring and sole of the brass block to which the negative lead is attached should all be clean and not lacquered to allow for good electrical continuity. The positive battery lead is usually connected to the frame with the negative lead to the contacts.

Opinion as to the timekeeping property of these clocks vary. Mr. Wallace publically claimed a rate of plus or minus two minutes a year. Some owners of these clocks would uphold this statement while others violently refute it. The truth is probably somewhere between the two schools of thought, and in any event it is somewhat irrelevant as it is doubtful if their acquisition is accomplished with the view of their competing with modern quartz crystal timepieces. A rating of a few minutes a week is the most commonly reported and is surely acceptable to most owners.

One of the factors that led to the decline in popularity of the clocks was that the clock continued to operate on a run down battery but this resulted in an inefficient swing and dropped impulse and hence poor timekeeping. Had the clock stopped the owner would have promptly replaced the battery and acceptable timekeeping would have been quickly restored. This eventuality must also be borne in mind when assessing accuracy over a period of time.

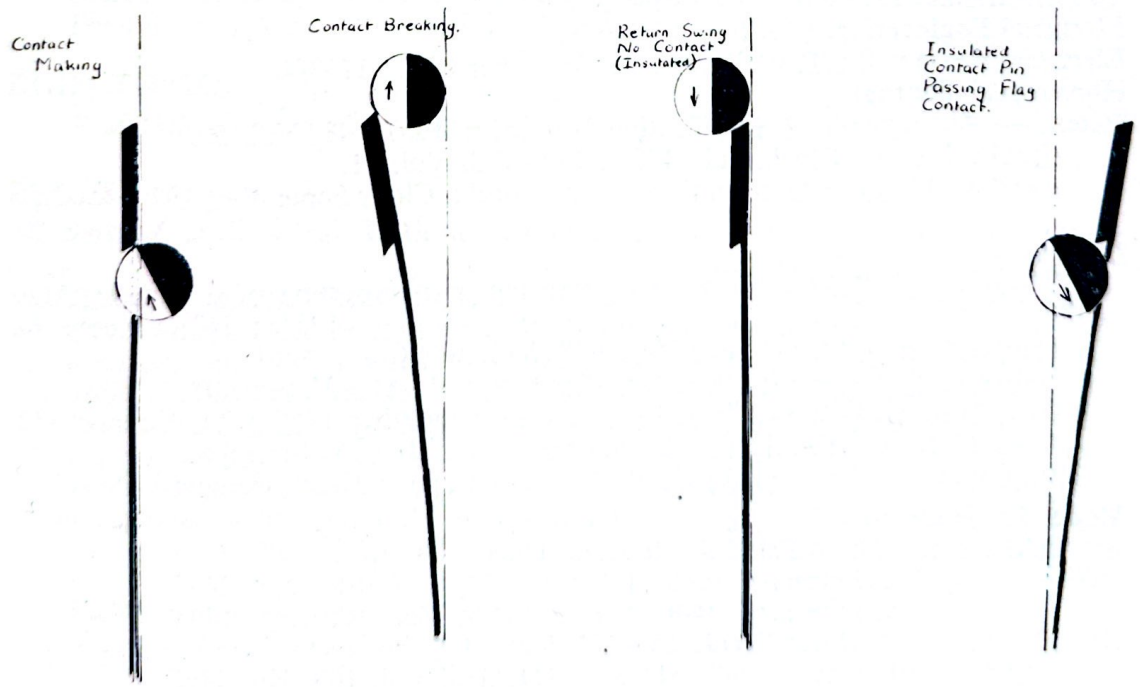


Figure 23

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APPENDIX I

PATENT SPECIFICATIONS OF CLOCKS MANUFACTURED BY THE COMPANY

No. 14,614 **AD 1906**

Date of Application, 26th June, 1906 — Accepted, 14th February, 1907

COMPLETE SPECIFICATION

" Improvements in or relating to Electric Clocks "

I Herbert John Haddan, of the Firm of Herbert Haddan and Co., 31 and 32 Bedford Street, Strand, W.C. London, Consulting Engineer, do hereby declare the nature of this invention a communication to me from abroad by Kutnow Brothers, of 853 Broadway, New York, United States of America, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :—

This invention relates to electric clocks and watches in which the oscillations of the balance wheel are maintained by electric energy derived from any suitable source. The principal objects of the invention are to attain the maximum of simplicity in construction, whereby liability to derangement is reduced, and high efficiency in the operation of the mechanism, whereby the amount of battery power required is reduced to a minimum and a battery of sufficient capacity to operate the clock for a long period of time can be enclosed within the clock casing without making the same unsightly or clumsy. Incidentally to these main objects, it has been sought to keep the cost of construction low, to make the entire mechanism with its actuating battery, if one be applied directly to the mechanism, as compact as possible and to secure novelty and attractiveness in appearance. These objects are attained primarily by mounting the actuating magnet upon the oscillating balance wheel and mounting the armature in a fixed position, the electric connections and co-operating devices being combined therewith in a suitable manner. This arrangement of the magnet and armature is contrary to all previous known constructions in which the armature swings and the electromagnet is permanently fixed. The combination of parts referred to enable a high efficiency to be obtained, the poles of the magnet being located at the periphery of the oscillating balance wheel so that the impulse which accelerates or renews its motion is given to it at the instant of its most rapid motion and the maximum amplitude of oscillation is attained. By fixing the distance between the magnet poles and armature to a minimum the waste of energy in starting an armature from a condition of rest at each energization of the magnet is avoided, and the amount of electrical energy required to maintain the oscillations of the balance wheel is so small that a single cell of an ordinary dry battery will suffice to keep the clock in operation for a long period of time. As the magnet poles are in motion the armature has its maximum of energy when contact is made during each oscillation, then the poles of the magnet are closest to the armature whereby the highest efficiency is attained and the battery lasts relatively longer. The shaft on which the balance wheel turns rests in ball bearings to ease its motion. The use of the usual mechanical escapement is dispensed with which simplifies the mechanism. The balance wheel is split to give it the compensating effect of the compensating pendulum which aids in keeping good time. Various details of construction have also been improved with a view to the attainment of the several objects above named, all as will be more fully explained hereinafter with reference to the accompanying drawings in which

Figure 1 is a view in front elevation of a clock which embodies in desirable form the present improvements.

Figure 2 is a view thereof in end elevation, the clock face and one of the bearings of the balance wheel being shown in section.

Figure 3 is a detail view in elevation showing the hair spring and regulating device.

Figures 4 and 5 are detail views illustrating the operation of the contact devices.

Figure 6 is a detail view illustrating a slight modification of the devices for transmitting movement from the balance wheel to the clock train.

In the clock represented in the drawings the actuating battery is represented as incorporated with the clock, although, as will be readily understood, in clocks or time pieces of a different type it may be desirable to derive the electric energy from some suitable source remote from the clock mechanism, for instance small or ornamented desk clocks may be operated by a battery concealed within one of the drawers of said desk. In the construction shown a single cell of an ordinary dry battery, sufficiently represented by the terminals at **a**, is placed in a suitable case **b** mounted upon a base **b'** which supports the entire mechanism. A bracket **c**, secured to the case **b**, supports the clock face **d** and a simple clock train **e** which is of ordinary construction and requires no detailed description herein except to note that it is shown as having a worm actuating gear **e'**. The latter is engaged by a driving worm **f** on the shaft of which, mounted in a suitable bearing, is a ratchet wheel **f'**. The latter is operated by a driving dog **g** which, in the construction shown in Figures 1 and 2, is a rod upon one arm of a bell crank lever **h** and pressed by a coil spring **g'** towards the ratchet wheel **f'**, reciprocating in a guide **g²**. The bell crank lever **h** is restored by a spring **h'** to normal position after actuation by the balance wheel in the manner hereinafter described.

In suitable standards **i** is mounted the shaft **k** of the divided, compensating balance wheel **l** which has mounted therein so as to oscillate therewith the actuating magnet **m**, the poles of which are at the periphery of the said balance wheel. The shaft **k** is provided with an arm **n** in which is mounted a contact pin **o** insulated from the arm **n** by a fibre bushing **o'**, which is cut away to expose the pin to contact on one side, as shown in Figures 2, 4, and 5. Upon the supporting framework is mounted an insulated contact spring **p** having an **L**-shaped head **p'**, the shank of the head standing directly in front of a pin and roller **h²** carried by the bell crank lever **h**. Head **p'** of the spring **p** is so placed with reference to the path of movement of the pin **o**, as it oscillates with the balance wheel, that in the oscillation to the right, indicated in Figure 4, the pin **o** with its bushing **o'** pass to the right of the spring head, throwing the spring to the left slightly, as indicated by dotted lines in Figure 4, the pin **o** making no electrical contact therewith by reason of the interposition of the bushing **o'**. The bell crank lever **h**, likewise, is not actuated during this movement as the spring **p** is thrown away from the pin and roller **h²**. In the oscillation to the left, however, as indicated in Figure 5, the pin **o** comes up in front of the spring head **p'** and makes electrical contact therewith, at the same time throwing the spring back against the pin and roller **h²** and rocking the lever **h** upon its pivot, as indicated in Figure 5, and thereby driving the dog **g** in a direction to actuate the ratchet wheel **f'** and so give the clock train a forward movement. When one or a few contacts are slipped the clock does not stop as those of other constructions do, the balance wheel will continue to oscillate because it is heavy on account of the magnet therein which imparts quite a momentum. The contact spring **p** may be made of three laminae of different lengths well pressed together. The one to the left which has the **L**-shaped head is longest and therefore the head moves easily to and fro. The middle one is of medium length and the one to the right is shortest. By virtue of this arrangement good contact is made and there is little resistance when the pin returns. This requires less power when the pin returns and gives high efficiency both electrically and mechanically and the spring is quickly brought to rest.

The shaft **k** on the balance wheel has applied thereto a hair spring **r** provided with the usual regulating device **r'**, as shown in Figure 3. The hair spring gives the return movement of oscillation to the balance wheel after the energy of the actuating magnet **m** has been expended, the energy of such magnet acting upon an armature **s** which is fixed to the supporting frame and in very close proximity to the path of movement of the poles of the magnet **m.** As shown in Figure 2, the armature **s** is of extended length and on the same radial line as the poles of the magnet **m,** so that the magnet, in its oscillation with the balance wheel, has time to discharge its magnetism and thereby avoid any retardation which might be occasioned by residual magnetism and so decrease the efficiency of the mechanism, and influence the timekeeping quality of the clock.

As will be understood by reference to Figure 1, one pole of the battery is connected by a suitable conductor a^1 to the binding post a^2 on the supporting framework. Thence current is conducted through the supporting framework and the hair spring **r** to the balance wheel **l** and from a binding post l^1 thereon directly to one end of the magnet coil **m,** the other end of such coil being connected to the insulating pin **o**. The other pole of the battery is connected by a suitable conductor a^3 to an insulated binding post a^4, from which connection is made, as indicated at a^5, to the insulated contact spring **p.** The pin **o** is so placed with respect to the poles of the magnet that it makes contact with the contact spring **p,** as indicated in Figure 5, just as the pole of the magnet approaches the fixed armature **s** near enough to include it within the magnetic field, and breaks the contact just as the magnetic pull upon the balance wheel attains its maximum, so that there is no retardation. By these means the balance wheel receives, through the momentary energization of the magnet **m,** an impetus just sufficient to maintain the oscillation of the balance wheel. When that impetus is expended the hair spring **r** acts to return the balance wheel to the limit of its movement in the opposite direction and then again to give movement in the forward direction until the pole of the magnet again approaches the armature.

It will be observed that the arrangement of the oscillating magnet and balance wheel upon the horizontal axis, with the armature stationary beneath the balance-wheel, permits a very close adjustment of the armature with respect to the poles of the oscillating magnet to be maintained without regard to any looseness of fit that there may be of the shaft in its bearings, so that the efficiency of the mechanism can be maintained at its maximum. Furthermore, this arrangement permits the employment of a feature of construction which is not only useful but adds to the attractiveness of the mechanism. That is to say, the shaft of the balance wheel is supported not only in general bearings, but with an end thrust pivot bearing, so that the clock will run in any position, and at the same time the ball or roller journal bearing is visible, forming an attractive feature.

In each of the two standards **i** is mounted a sleeve **t** which forms a cup for bearing balls **t'**, the end of the shaft **k** being reduced as at k^1 to bear on the balls. The end of the sleeve **t** is closed by a disc **u** of flint glass, which is held in place by a bezel or beaded sleeve **v** which has a screw threaded engagement with the sleeve **t.** The extremity of the shaft **k** is tapered to a point, as at k^2, to have a pivot bearing against the glass disc **u.** If the clock, therefore, is tipped forward or back the mechanism will continue to operate without retardation and the ball bearings being visible through the glass form an attractive and ornamental feature.

It is obvious that various changes may be made in details of construction and arrangement without departing from the spirit of the invention. One such modification of the transmission devices is illustrated in Figure 6, wherein the worm **f** is arranged vertically and the ratchet wheel f^1 thereof is engaged by a dog g^2 which oscillates upon a pivot g^3. The upper end of the dog g^2 carries an insulated head g^4 which stands behind the insulated contact spring p^2, with which the contact pin **o** of the balance wheel makes contact in its movement in each direction, thus effecting the energization of the magnet once in each complete oscillation and actuating the clock train **e,** through the worm wheel e^1, twice for each complete oscillation. Var-

ious other modifications in detail, will suggest themselves, and it is to be understood that the invention is not limited to the precise construction and arrangement of the parts shown and described herein.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is :—

1. In an electric clock, the combination of a clock train, a balance wheel, means for transmitting motion from the balance wheel to the clock train, an electro magnet mounted with the balance wheel, a stationary armature and circuit connections and contacts whereby the magnet is momentarily energized as its pole approaches the armature.

2. An electric clock as in Claim 1 having a contact pin carried by the balance wheel, and a contact spring located in the path of movement of the pin for the purpose set forth.

3. An electric clock, as in Claims 1 and 2 wherein the contact pin carried by the balance wheel is insulated on one side and the contact spring has a broad L-shaped head located in proximity to the path of movement of the pin whereby the pin passes on one side of said head in one direction and on the other side of said head in the other direction.

4. An electric clock, as in Claims 1 and 2, transmission devices having a portion located in proximity to the contact spring to be actuated thereby for the purpose set forth.

5. An electric clock as in Claims 1 and 2 having a lever mounted in proximity to the contact spring to be actuated thereby, and means whereby the movement of the lever is made to actuate the clock train.

6. An electric clock as in Claim 1 wherein the balance wheel is mounted upon a horizontal axis and has roller journal bearings and end thrust bearings.

7. An electric clock as in Claim 6 wherein glass sheets close the outer ends of the roller journal bearings and the shaft of the balance wheel has pivot bearings against said glass sheets through which the roller bearings are visible.

Dated this 26th day of June, 1906.

HERBERT HADDAN & Co.,
Agents for Applicant,
31 & 32 Bedford Street, Strand, W.C. London.

Fig. 1.

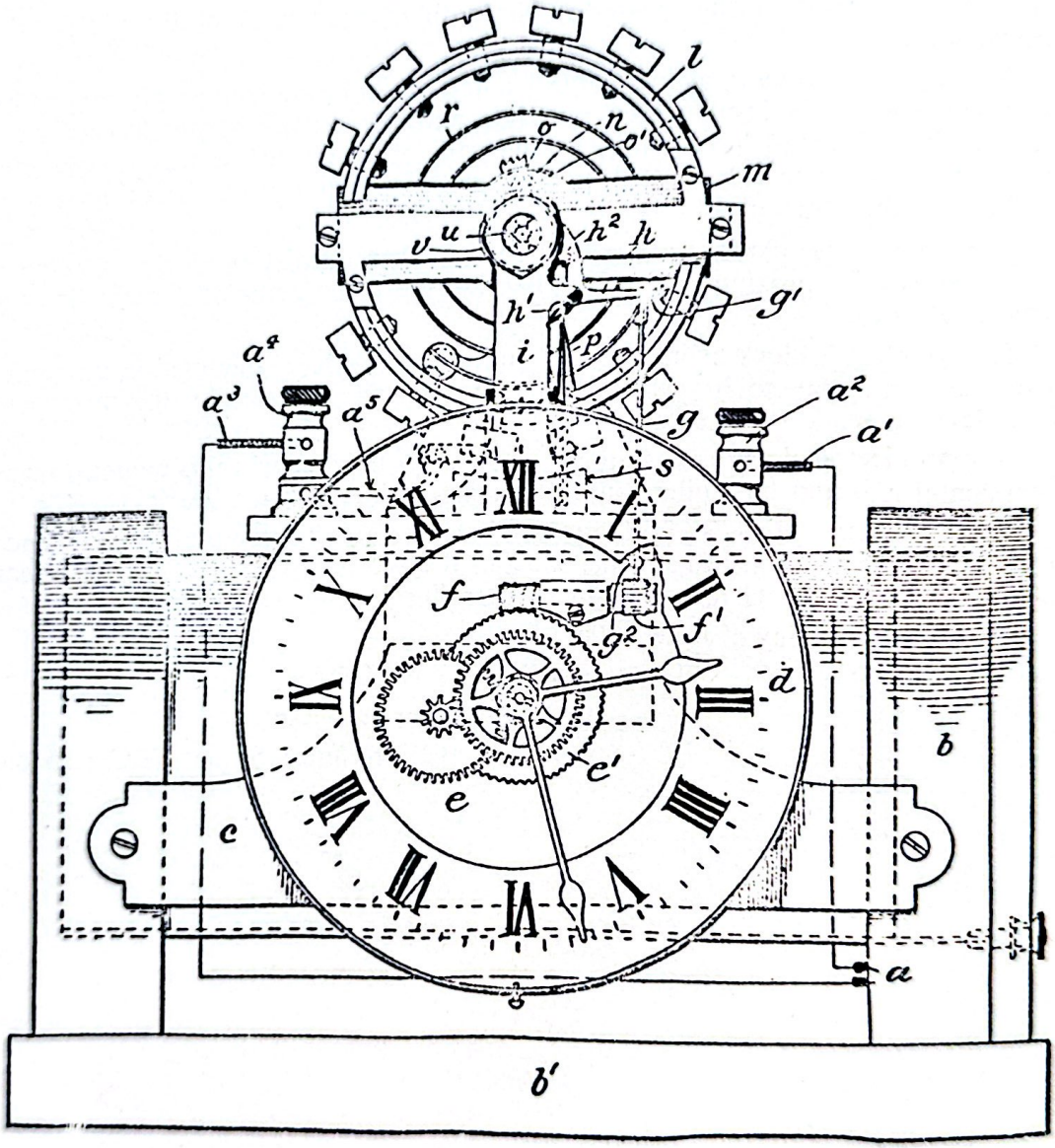


Fig. 2.

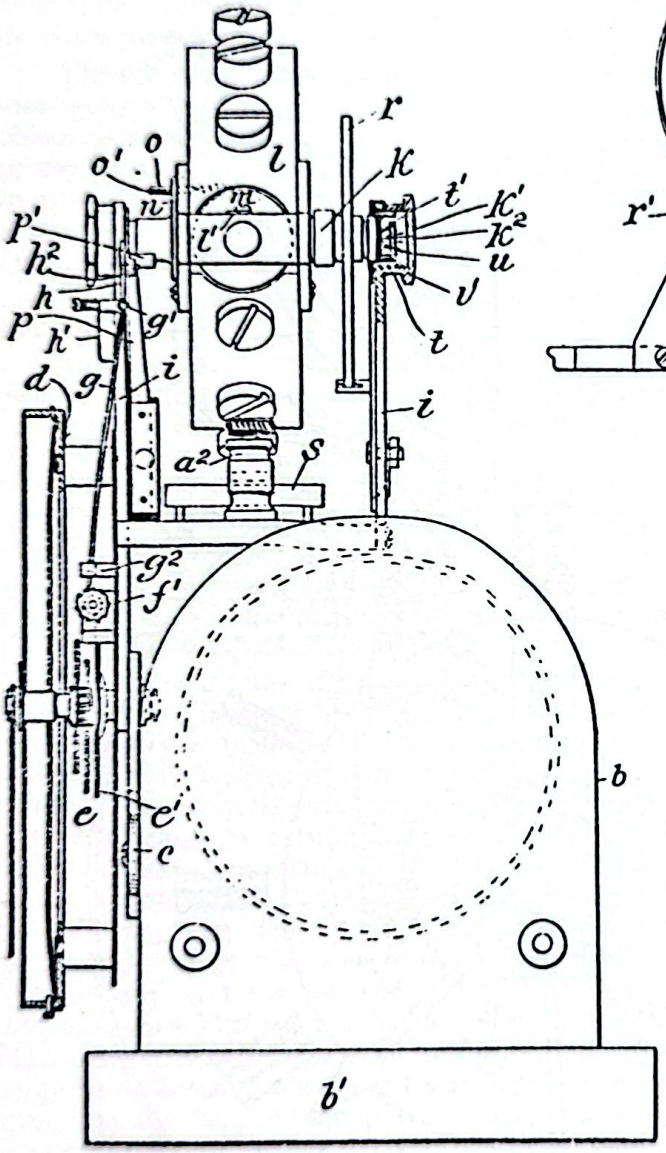


Fig. 3

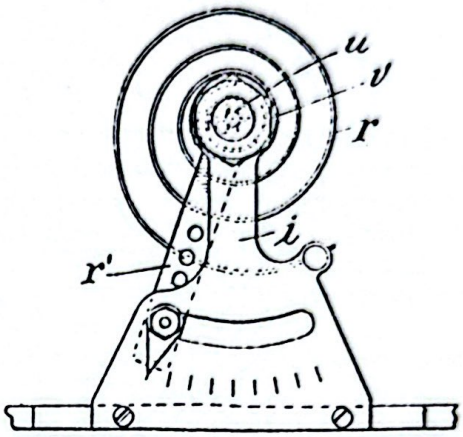


Fig. 4.

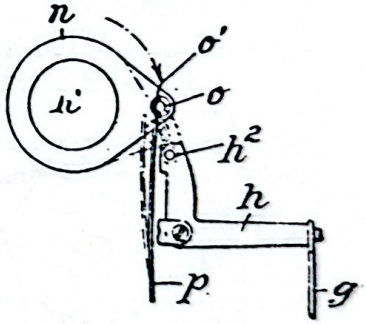


Fig. 5.

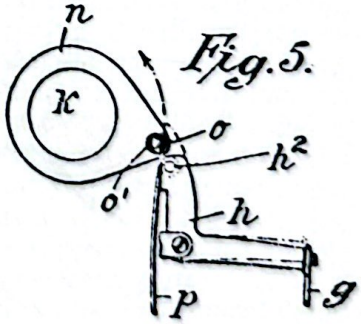
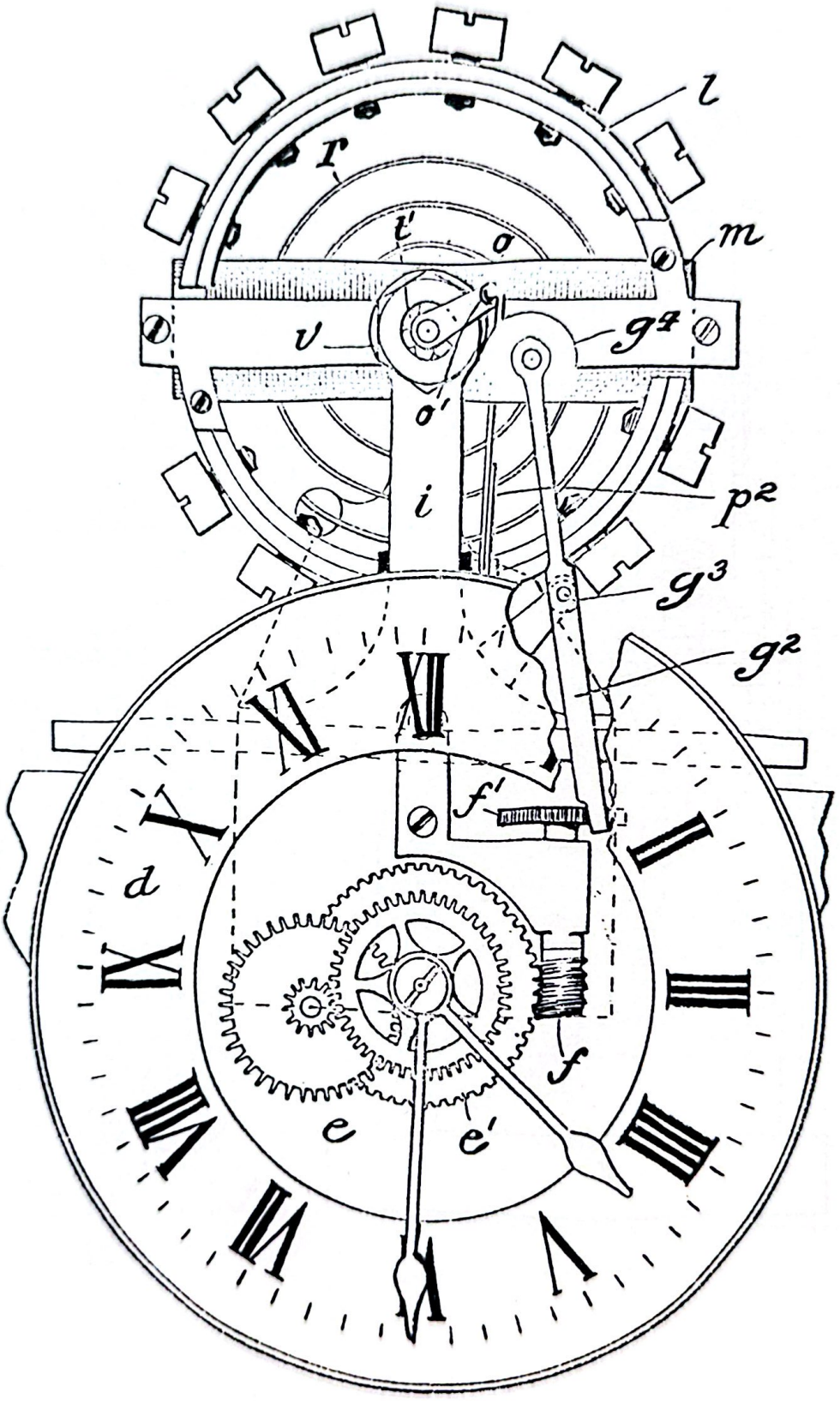


Fig. 6.



No. 4711 A.D. 1911

Date of Application, 24th Feb., 1911 — Accepted, 14th May, 1911

COMPLETE SPECIFICATION

Improvements in and relating to Self Winding Clocks

We **Timothy Bernard Powers**, Engineer, and **Eureka Clock Company, Limited**, Manufacturers, both of 361, City Road, London, E.C., do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :—

This invention relates to self winding clocks, and refers particularly to clocks in which the rewinding is effected by means of an electro motor which is energized from time to time by means of contacts which are closed by a suitable member of the clock mechanism.

The present invention, whilst it provides an improved construction and arrangement generally of the operative mechanism of clocks of this type, has for its primary object to provide an improved circuit closing and opening means for ensuring the proper closing and opening of the motor circuit at the desired intervals, and also to provide circuit closing and opening members whereby a proper and effective contact may be secured so that not only is the action of the motor ensured, but its intermittent action owing to improper contact is avoided.

The invention further provides for the rewinding of the clock by hand when so desired.

In order that the invention may be the better understood, drawings are appended illustrating a clock embodying the present invention, in which :—

Fig. 1. is a sectional front elevation.
Fig. 2. is a back view.
Fig. 3. is a top plan of the main spring barrel.
Fig. 4. is a front elevation partly in section of said barrel.
Fig. 5. is a plan from the under side.
Fig. 6. is a view showing more clearly the arrangement of the contacts.
Fig. 7. is a side elevation of one arrangement of the fixed contact.
Fig. 8. is a plan of an alternative arrangement.

Referring to the accompanying drawings, it will be seen that the invention in the present instance is applied to a clock of which the base **a** forms a receptacle for a battery a^1 from which the necessary current is obtained for driving the motor whereby the winding is effected. It will however be understood that any other arrangement may be employed, and that the battery or other source of energy need not in all cases be carried upon the clock itself. The motor in the present instance is also arranged to form a part of the clock itself, and comprises a yoke a^2, secured in any convenient manner to the base **a**, and provided with magnets a^3 terminating in pole pieces a^4. The upper ends of the pole pieces are provided with projections a^5, a^6 which respectively serve for the attachment of the framing carrying the clock mechanism, and for the support of blocks of non conducting material such as vulcanite to which the brushes a^{16} of the armature **b** are secured, see Figs. 1 and 6. The armature is a three pole armature, and in order that the torque of the poles may be uniform to ensure self starting at all points, the air gap between the armature and the face of said poles is increased at the points **x x**. Figs. 1 and 6. The clock movement, which may be of any suitable form, is supported from the pole pieces by means of the plates **c** c^1, to one of which plates the back plate or frame c^2 of the movement is secured in any convenient manner. The clock movement forms no part of the present invention, and except for such parts as are essential to the proper understanding of the invention, is omitted from the drawings. **d**, Figs. 1, 2, 3, 4, 5, 6 indicates the main spring barrel which as shown in Fig. 4 is perforated at d^1, and has passing through it a pin d^2 which is attached to a short spring piece or arm d^3, curved to agree with the outer contour of the barrel **d**, to which it is attached by screws d^4. The pin d^2 passes to the spring d^3 and projects upon the outside of the said spring. The tendency of the spring d^3 is to keep the inner end of pin

d^2 in contact with the outer convolution of the main spring **e**, Fig. 4. By this means the partially wound or unwound state of the spring **e** will control the position of the projection d^2 with respect to the outer surface of the spring barrel, and said pin will project more and more as the spring runs down, and the diameter of its convolutions increases. It will be understood that the substance of the spring or arm d^3 is not sufficient to cause it to offer any substantial resistance to the expansion of the convolutions of the spring. The pin d^2 forms one end of the electric circuit, the battery a^1 aforesaid having one of its poles connected to one of the studs such as **y** by which the battery is clamped by means of plate y^1 to the base **a** see Fig. 1. The current thus is enabled to pass, or is "grounded" through the base, pole pieces of the motor and frame of the clock to the pin d^2. Secured to one of the pole pieces of the motor is a block of insulating material **f** to which is secured a resilient contact f^1, one end of which projects into the line of movement of the pin d^2. The length of the arm however is such that it does not come into contact with the pin d^2 until the main spring is sufficiently unwound to require rewinding. The contact f^1 is connected to one end of the wire on the magnet poles whilst the opposite end of the winding on the poles of the said magnet is connected to one brush a^{16} of the armature, the other brush being connected to the lead f^2 connected to the opposite pole of the battery a^1. The connection between the lower ends of the winding on the magnets, and which connection is not shown, may be led through the yoke or base. Under these circumstances as the barrel **d** rotates, the projection d^2, on the spring being sufficiently unwound, will come into contact with the contact f^1 closing the circuit and energising the motor which will continue to run so long as the contact is maintained, that is to say until the spring is sufficiently wound up to permit the projection d^2 to be withdrawn clear of contact f^1. The motion of the armature is transmitted to the main spring spindle **g** by means of a pinion g^1 upon a spindle g^2, which spindle carries a second larger pinion g^3 which in its turn receives motion from a pinion g^4 on the motor spindle. The pinion g^1 in mesh with a pinion g^{12} on the spindle **g** of the main spring. It may be found in practice that with a simple contact f^1 and pin d^2, the pressure of the said arm may not ensure a lasting contact sufficient to keep the motor in operation for the desired period, but that there may be a tendency for the motor to start and top a number of times until the movement of the barrel establishes a sufficiently firm contact. As this starting and stopping is injurious to the battery by reason of the fact that more current is required to start the motor than to keep it running, we may provide means whereby this objection may be overcome. This is effected by providing a second pin **h** upon the spring piece d^3, which pin is placed in advance of the pin d^2, and comes into contact with the end of the contact f^1, with which however it does not establish any electrical contact, and bends said arm downwards until the movement of the barrel **d** carries pin **h** free thereof when the arm springs upwards against the pin d^2 and presses thereon establishing a firm contact therewith, see Fig. 6, until the pin d^2 passes beyond the end of the said arm. In order to avoid any electrical contact between pin **h** and contact f^1, the pin **h** is arranged to one side of the pin d^2 and the contact f^1 is increased in width at its outer end as shown in Fig. 8. A piece of vulcanite or other material f^{11} is applied to the end of the contact f^1, which is cut away at point f^2 to permit of the contact pin d^2 with said arm in order to close the circuit. Where a single pin such as d^2 is employed, the difficulty may be met by the employment of an arrangement such as shown in Fig. 7. In this case two resilient arms or plates **i** i^1 are employed, one of which i^1 is arranged above the other, and is somewhat shorter being provided with an extension i^2 formed of vulcanite or other non-conducting material. The two plates are secured to a piece of non-conducting material, and the arrangement is such that during the rotation of the barrel **d**, the pin d^2 first comes into contact with the upper surface of the non-conducting material i^2 pressing both plates down until it rides off the end of the said non-conducting material, and comes into contact with the conductor or plate **i** which is sufficiently depressed to ensure a good contact between the parts. As the effective contact in all the arrangements described is a rubbing contact, there is little or no chance of failure owing to oxidation or the collection of dust at the points of contact as the friction between the parts serves to keep them clean.

In order that the clock may be wound by hand if so desired, I provide the spindle **g** of the main spring with a turn button or head **j** which is arranged in the usual manner at the back of the clock. The spindle **g** is also provided with ratchet wheels j^2, j^1 which are respectively engaged by pawls j^3, j^4 disposed one upon the inner face of the pinion g^{12} which is free on its shaft, and the other on the frame of the clock. By this means whilst the rotation of the turn button or head acts directly upon the spring, the rotation of the wheel g^{12} which is connected to the spindle **g** through the pawl j^3 also acts upon the spindle **g**. The second pawl j^4 is provided to prevent recoil of the main spring after winding. Whilst as aforesaid the pin d^2 may be, and is, preferably carried by a body independent of the main spring, it will be understood that the said pin may be applied to the main spring itself. This arrangement however as will be readily understood is open to the objection that it may weaken the main spring, or if the pin is not attached thereto in a manner calculated to affect the strength of the metal at the point of attachment if the means of attachment be in the nature of a clip for example, may be prejudicial to the proper action of the spring. Obviously the arrangement of the motor may be other than that described and illustrated.

Obviously the fixed contact may be arranged in any other manner than that described and shown. For example a lever may be pivotted to the frame of the clock which may act by gravity being lifted by the first pin on the barrel and when released falling upon the second pin.

By arranging the contact so that it is brought into an operative position by the expansion of the main spring, it is evident that in the event of the failure of the contact during one or more revolutions of the barrel, the expansion of the spring will finally reach such a point that a contact cannot fail to be established, but this contingency is so remote that it is practically negligible.

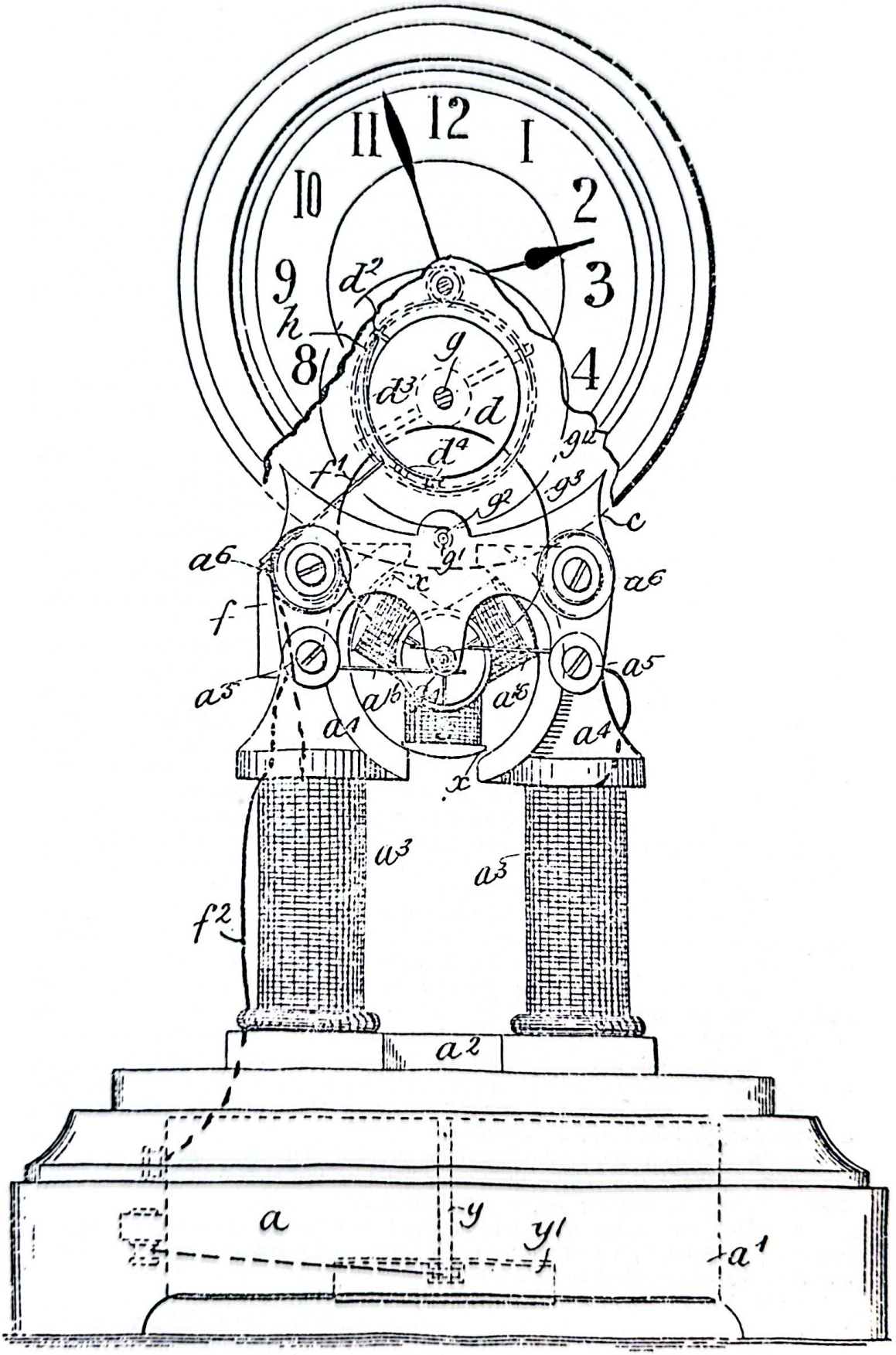
Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we claim is :—

1. In a self-winding clock of the type specified, means for closing and opening the motor circuit actuated by the expansion of the coils of the main spring.
2. In a self-winding clock of the type specified, means for closing and opening the motor circuit as specified in Claim 1, comprising a pin or projection carried by a resilient body upon the spring barrel, one end being in contact with the outer convolution of the spring, whilst the other projects from the said resilient body, and a fixed contact arranged in the path of the outer end of the stud.
3. In a self winding clock of the type specified having means for closing and opening the motor circuit as in Claims 1 and 2, the provision of two pins upon the flexible body on the spring barrel, and a contact having a partly insulated surface substantially as and for the purpose stated.
4. In a self-winding clock of the type specified, having means for closing and opening the motor circuit as in Claims 1 and 2, the provisions of a contact arranged as described with reference to Fig. 7 of the appended drawings.
5. In a self-winding clock of the type specified, and having means for closing and opening the motor circuit as specified in the preceding claims, the provision of means whereby the winding of the clock may be effected by hand.
6. In a self winding clock of the type specified, and having means for closing and opening the motor circuit as specified in Claims 1 to 4, the herein described and illustrated construction and arrangement of an electro motor so that it forms a base or support for the clock movement.
7. In a self-winding clock of the type specified, and having means for closing and opening the motor circuit, the arrangement of the surface of the magnet as described for equalising the torque on the armature.
8. An electric clock of the type specified, and having means for closing and opening the motor circuit as specified in Claims 1 to 5, constructed and arranged substantially as described and illustrated.

Dated this 24th day of February, 1911.

J. E. EVANS - JACKSON & Co.,
Agents for the Applicants.

Fig. 1.



12
I
2
3
4
9
8
10
11
h
d²
g
d³
d
d⁴
f¹
g²
g³
g⁴
c
a⁶
g¹
x
f
a⁵
a⁴
a³
f²
a²
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y
y¹
a¹

Fig. 2.

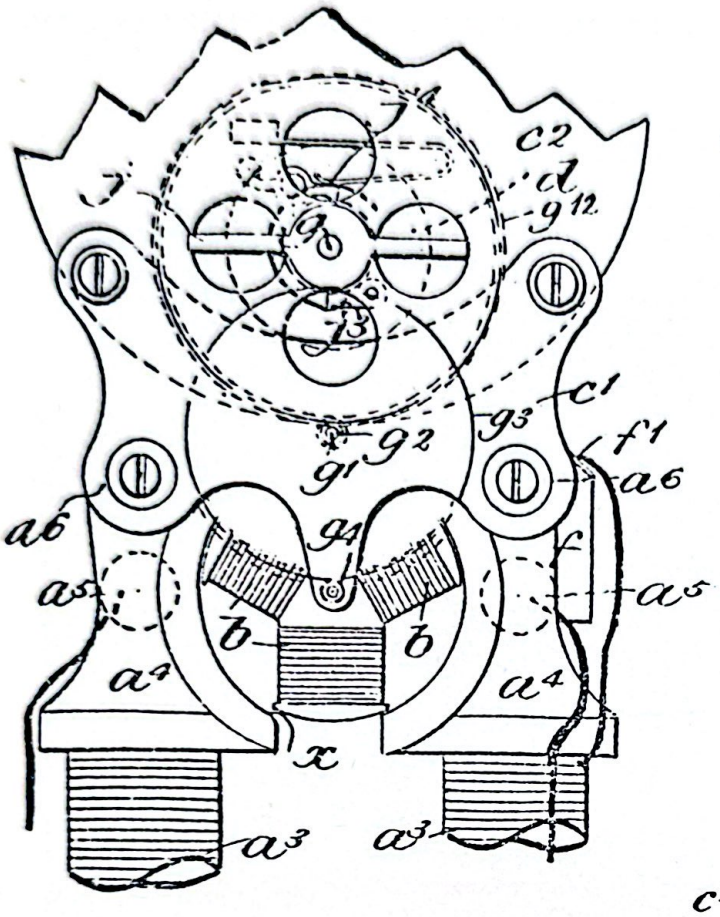


Fig. 3.

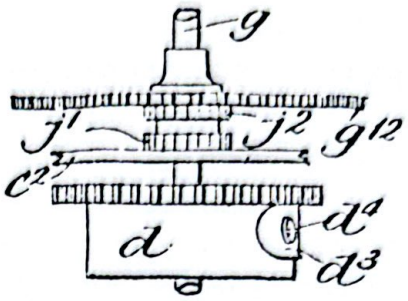


Fig. 4

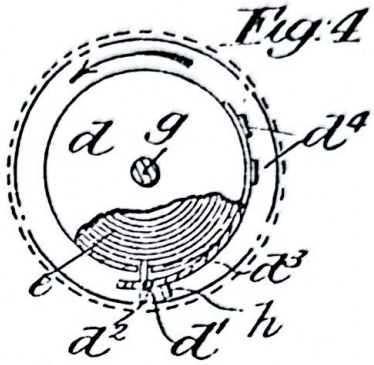


Fig. 5

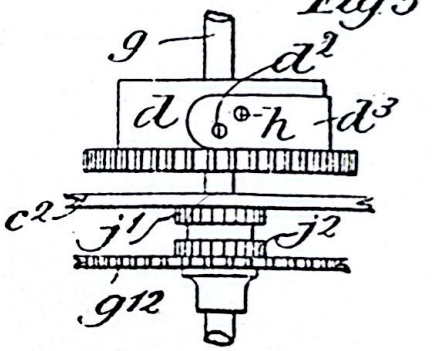


Fig. 7.

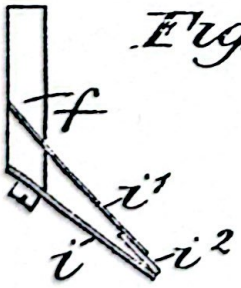


Fig. 6.

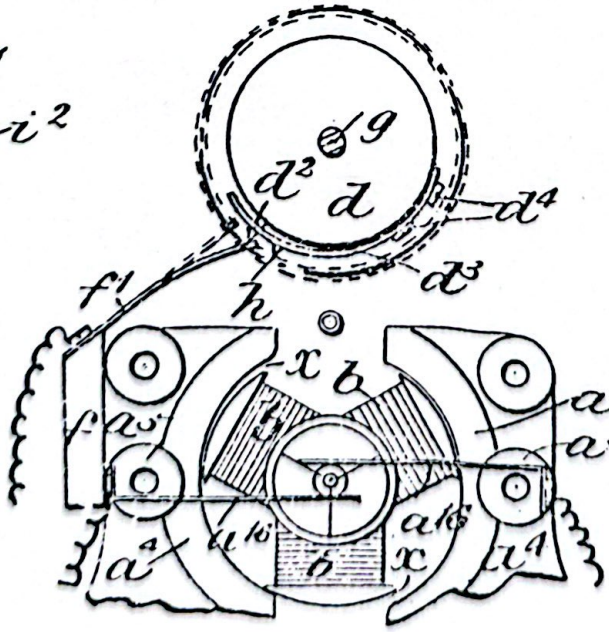
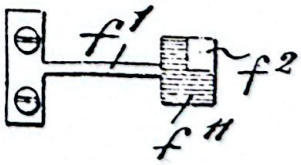


Fig. 8



the Schedule hereto and which shares form part of the shares to be allotted to the said Sigismund Kutnow Hermann Kutnow and Gustav Kutnow under the hereinafter recited agreement of the Twenty sixth day of June One thousand nine hundred and eight IN WITNESS whereof the parties hereto of the second and third parts have hereunto set their hands and the Company has caused its common seal to be affixed the day and year first above written _____

THE SCHEDULE ABOVE REFERRED TO

Name of Nominee	No. of Shares	Description of Shares	Distinctive Numbers
Timothy Bernard Powers	2,500 25	Ordinary Founders	15401 to 17900 152 to 176

Witness to the signing hereof by the said Sigismund Kutnow Hermann Kutnow Gustav Kutnow and Timothy Bernard Powers

Sigismund Kutnow.
Hermann Kutnow
Gus Kutnow
T. B. Powers

H. V. Baines
Solicitor
37 Queen Victoria Street
E.C.

THE COMMON SEAL of Eureka Clock Co. Ltd was hereunto affixed in the presence of

Sigismund Kutnow. Director.

Frank W. Lowell Secretary.

Number of Certificate } 98867/10 B13

Form No. 45

"THE COMPANIES ACTS, 1862 to 1907."

Return of Allotments

OF

Eureka Clock Company

LIMITED,

from the 30th day of July, 1908

to the 26th day of August, 1908,

A Companies' Fee Stamp of 5s. must be impressed here

Made pursuant to Section 7, Sub-section 1, of The Companies Act, 1900.

(To be filed with the Registrar of Joint Stock Companies within one month after the Allotment is made.)

REGISTERED 90470 27 AUG 1908

Distinguish between Preference, Ordinary, or other descriptions of Shares.

*Number of the Ordinary Shares allotted payable in Cash 3300.

* " " Founders " " 33

*Nominal Amount of the Ordinary Shares so allotted £3300 · 0 · 0

* " " Founders " " £33 · 0 · 0

*Amount paid or due and payable on each such Ordinary Share £1 · 0 · 0 .

* " " " " " " Founders " £1 · 0 · 0 .

Number of Shares allotted for a consideration other than Cash .... } 15000 Ordinary. 150 Founders

Nominal Amount of the Shares so allotted .... £15,150 · 0 · 0 .

Amount to be treated as paid on each such Share .... £1 · 0 · 0 .

The Consideration for which such Shares have been allotted is as follows:—

The sale of an invention of an Electric Clock Patent Rights and Premises under an Agreement dated the 26th day of June 1908 and made between Sigismund Kutnow Hermann Kutnow and Gustav Kutnow of the one part and Frank Wilfred Jowett as Trustee for the Company before its incorporation of the other part and which Agreement has since been adopted by the Company and which Agreement provided for the allotment of the above fully paid Shares to the said Sigismund Kutnow Hermann Kutnow and Gustav Kutnow or their nominees and by an Agreement dated 30th July 1908 and made between the Company of the first part and the said Sigismund Kutnow Hermann Kutnow and Gustav Kutnow of the second part and Timothy Bernard Powers of the third part it was agreed that the Company should allot to the said Timothy Bernard Powers as nominee of the said Sigismund Kutnow Hermann Kutnow and Gustav Kutnow the Shares credited as fully paid set opposite to his name in the Schedule to the said Agreement.

TELEGRAMS: "CERTIFICATE, LONDON." TELEPHONE NUMBER: 246 HOLBORN.

JORDAN & SONS, LIMITED,

Company Registration Agents, Printers, Publishers, and Stationers,

116 & 117 CHANCERY LANE, LONDON, W.C.

Presented for filing by F. W. Jowett

111 Farringdon Road. E.C.

NAMES, ADDRESSES, and DESCRIPTIONS of the Allottees of Shares in

SURNAME.	CHRISTIAN NAME.	ADDRESS.
Ekert	Maximilian	Ekert Haus Hamburg 36
Druisberg	Martin	133 Kopnicker Strasse Berlin
Wetton	George	Monkhams Drive Woodford Green.
Tipton	Thos. B.	1 Old Bond Street. W.
Moore	Mark. R.	55 Hallam Street W.
McLeod	J. M.	2 Hillsrop Road Camden Town.
Probyn	P. J.	Camden House Pontypool
Stephens	James.	129 Maida Vale. W.
Preston	G. M.	118 Newgate Street E.C.
Boxall	Richard Dalton	134 Aldersgate St. E.C.
Becker	Pitt	18+19 Fenchurch St. E.C.
Radisic	S.	28 Teracroft Avenue N.W.
Pownall	W. Edward	35 Mt Ararat Rd Richmond
Pitcher	Ernest Stephen	3 Clerkenwell Rd. E.C.
Scott	A.W. Birnie	4 Rue Chanteau fegarde Paris
Wolff	Marc	49 Sussex Place. W.
Godin	Gaston. E.	1 Red Lion Square. W.C.
Godin	André. A.	1 Red Lion Square. W.C.
Kutnow	Sigismund	44 Fitzjohns Avenue N.W.
Kutnow	Hermann	41 Farringdon Road. E.C.

NOTE.—This margin is reserved for binding, and must not be written across.

Eureka Clock Company.

Form No. 45a.
Limited.

DESCRIPTION.	Number of Preference Shares allotted.	Number of Ordinary Shares allotted.	Number of ~~Deferred~~ Founders' Shares allotted.
Merchant.	——	500.	5.
Manufacturer.	——	500.	5.
Advertising Manager.	——	100.	1.
Merchant.	——	100.	1.
Merchant.	——	200.	2.
Chartered Secretary.	——	100.	1.
Major	——	100.	1.
Merchant.	——	100.	1.
Merchant.	——	100.	1.
Gentleman.	——	100.	1.
Merchant.	——	200.	2.
Gentleman.	——	100.	1.
Bank Clerk	——	100.	1.
Merchant.	——	100.	1.
Wholesale Druggist	——	100.	1.
Merchant	——	200.	2.
Agent.	—	200.	2.
Agent.	—	200.	2
Merchant	—	4166.	41.
Merchant.	—	4166.	41.
	(Signature)	11432	113
Date 190	(Officer)		

6213—12.07

JORDAN & SONS, LIMITED, 116 & 117 CHANCERY LANE, LONDON, W.C.

NAMES, ADDRESSES, and DESCRIPTIONS of the Allottees of Shares in

SURNAME.	CHRISTIAN NAME.	ADDRESS.
Kutnow	Gustav	41 Farringdon Road E.C.
Kutnow	Sigismund	44 Fitzjohns Avenue N.W.
and Kutnow	Hermann	41 Farringdon Road E.C.
and Kutnow	Gustav	Do
Powers	Timothy B.	Do
Cassel	Nathan Gustav	4 Drapers Gardens E.C.

Eureka Clock Company Limited.

DESCRIPTION.	Number of Preference Shares allotted.	Number of Ordinary Shares allotted.	Number of Founders' Shares allotted.
		11432	113
Merchant.	——	4166.	41.
Do.	—		
Do.	—	2	2
Do	—		
Gentleman.	—	2500.	25.
Do.		200.	2.
		18300	183

(Signature) Frank H. Lovell

Date 190 (Officer) Secretary.

JORDAN & SONS, LIMITED, 116 & 117 CHANCERY LANE, LONDON, W.C.

Number of Certificate 98867

FORM No. 6A.

"THE COMPANIES (CONSOLIDATION) ACT, 1908."

FORM E

As required by Part II. of the Act (Section 26).

Companies' Fee Stamp of 5s. must be impressed here.

Summary of Share Capital and Shares

OF

Eureka Clock Company

LIMITED,

made up to the 13th *day of* January 1910.

(Being the Fourteenth Day after the date of the First Ordinary General Meeting in 1909).

Nominal Share Capital, £30,300 — divided into* 30,000 Ordinary / 300 Founders Shares of £*	1.0.0. / 1.0.0. each.
Total Number of Shares taken up* to the 13th day of January 1910 (Which number must agree with the Total shown in the List as held by existing Members)	30,000 Ordinary / 300 Founders.
Number of Shares issued subject to payment wholly in Cash	15,150.
Number of Shares issued as fully paid up otherwise than in Cash	15,150.
Number of Shares issued as partly paid up to the extent of —— per Share otherwise than in Cash	Nil.
‡There has been called up on each of 15,000 Ordinary Shares	£1.0.0.
" " " " 150 Founders "	£1.0.0.
" " " " "	£ —
§Total Amount of Calls received, including Payments on Application and Allotment	£15,150.0.0.
Total Amount (if any) agreed to be considered as paid on 15150 —— Shares which have been issued as fully paid up otherwise than in Cash	£15,150.0.0.
Total Amount (if any) agreed to be considered as paid on —— Shares which have been issued as partly paid up to the extent of —— per Share	£ Nil.
Total Amount of Calls unpaid	£ Nil.
Total Amount (if any) of sums paid by way of Commission in respect of Shares or Debentures or allowed by way of Discount since the date of last Summary	£ Nil.
Total Amount (if any) paid on ‖ —— Shares forfeited	£ Nil.
Total Amount of Shares and Stock for which Share Warrants to Bearer are outstanding — Shares	£ Nil.
Stock	£ Nil.
Total Amount of Share Warrants to Bearer issued and surrendered respectively since date of last Summary — Issued	£ Nil.
Surrendered	£ Nil.
Number of Shares or Amount of Stock comprised in each Share Warrant to Bearer — Number of Shares	Nil.
Amount of Stock	£ Nil.
Total Amount of Debt due from the Company in respect of all Mortgages and Charges which are required (or, in the case of a Company registered in Scotland, which, if the Company had been registered in England, would be required) to be registered with the Registrar of Companies, or which would require registration if created after the First day of July, 1908	£ Nil.

REGISTERED 7606 20 JAN 1910

NOTE.—Banking Companies must add a List of all their Places of Business.

* *Where there are Shares of different kinds or amounts (e.g. Preference and Ordinary, or £10 and £5), state the numbers and nominal values separately.*

‡ *Where various amounts have been called, or there are Shares of different kinds, state them separately.*

§ *Include what has been received on forfeited as well as on existing Shares.*

‖ *State the Aggregate Number of Shares forfeited (if any).*

☞ The Return must be signed, at the End, by the Manager or Secretary of the Company.

Telegrams: "CERTIFICATE, LONDON." Telephone Number: 246 Holborn.

JORDAN & SONS, LIMITED,

Company Registration Agents, Printers, Publishers, and Stationers.

116 & 117 CHANCERY LANE, LONDON, W.C.

Presented for filing by F. W. Towch, 361/363 City Road.

Names and Addresses of the Persons who are the Directors

OF

Eureka Clock Company Limited,

on the 13th day of January 1910.

NAMES.	ADDRESSES.
Sigismund Kuhnow.	114 Fitzjohns Avenue N.W.
Hermann Kuhnow.	361/363 City Road. E.C.
Gustav Kuhnow	Do

NOTE.—This margin is reserved for binding, and must not be written a

4

List of Persons holding Shares in Eureka Clock Company on the 13th day of January, 1910, and o or (in the case of the first Return) of the incorporation of the Company.

No. in Register Ledger containing Particulars.	NAMES, ADDRESSES, AND OCCUPATIONS.			
	Surname.	Christian Name.	Address.	Occupation.
1	Ekert	Maximilian	Ekerthaus 36. Hamburg	Merchant
2	Dinsberg	Martin	133 Kopnickerstrasse Berlin	Manufacturer
4	Tipton	Thos. B.	1 Old Bond St. W.	Merchant
5	Moore.	Mark R.	55 Hallam Street. W.	D°
7	Probyn	Percy J.	Camden House Pontypool	Major.
8	Boxall	Richard D.	134 Aldersgate St. E.C.	Gentleman.
9	Becker.	Pitt	18 & 19 Fenchurch St. E.C.	Merchant
11	Pownall	William E.	35 Mt Ararat Rd. Richmond Hill.	Bank Clerk
13	Kutnow.	Sigismund	44 Fitzjohns Avenue N.W.	Merchant
14	Kutnow.	Hermann	41 Farringdon Road. E.C.	Merchant.
15	Kutnow.	Gustav	41 Farringdon Road. E.C.	Merchant.
17	Powers	Timothy B.	41 Farringdon Road. E.C.	Gentleman.
18.	Wolff	Marc	49 Sussex Place. S.W.	Merchant.
19.	Godin.	Gaston E.	1 Red Lion Square. W.C.	Agent.
20.	Godin.	Andre. A.	1 Red Lion Square. W.C.	Agent.
22.	Kuehn.	Max	Fox Court. Holborn. W.C.	Merchant.
23.	Jones.	John. F.	31 bis Rue du Faubourg Montmartre Paris	Gentleman.
24	Cremieu-Javal	E.	187 Queens Gate. S.W.	Gentleman.
25.	Fermé	Gabriel	55 Boulevard de Strasbourg Paris	Merchant.
26.	Webb.	Harry Edward.	11 Charterhouse Bldgs. E.C.	Merchant.

NOTE.—This margin is reserved for binding, and must not be written across.

* The Aggregate Number of Shares held, and not the Distinctive Numbers, must be stated, and the column must be added up throughout, so as to make one total to agree with that stated in the Summary to have been taken up.

† When the Shares are of different classes these columns may be subdivided, so that the number of each class held, or transferred, may be shown separately.

Form No. 8.

Limited.

Persons who have held Shares therein at any time since the date of the last Return, showing their Names and Addresses, and an Account of the Shares so held.

ACCOUNT OF SHARES.

* Number of Shares held by existing Members at date of Return.†		‡ Particulars of Shares transferred since the date of the last Return or (in the case of the first Return) of the incorporation of the Company by Persons who are still Members.		‡ Particulars of Shares transferred since the date of the last Return or (in the case of the first Return) of the incorporation of the Company by Persons who have ceased to be Members.		REMARKS.
		Number.†	Date of Registration of Transfer.	Number.†	Date of Registration of Transfer.	
Ordinary	Founders					
500	5					
500	5					
100	1					
300	3					
100	1					
100	1					
200	2					
200	2					
5000	50					
5000	50	Jointly. Ord. 102 Founders 3	6 Nov 1908			
5000	50					
2200	22	Ord. 300 Founders 3	20th January 09			
500	5					
500	5					
500	5					
500	5					
500	5					
500	5					
200	2					
300	3					
22700	227					

(*Signature*)

(State whether Manager or Secretary)

NOTE.—This margin is reserved for binding, and must not be written across.

‡ The Date of Registration of each Transfer should be given, as well as the Number of Shares transferred on each date. The particulars should be placed opposite the name of the Transferee, and not opposite that of the Transferee, but the name of the Transferee may be inserted in the "*Remarks*" column, in a line only opposite the particulars of each Transfer.

JORDAN & SONS, LIMITED, 116 & 117 CHANCERY LANE, LONDON, W.C.

List of Persons holding Shares in Eureka Clock Company

on the 13th day of January, 1910, and of or (in the case of the first Return) of the incorporation of the Company.

Folio in Register Ledger containing Particulars.	NAMES, ADDRESSES, AND OCCUPATIONS.			
	Surname.	Christian Name.	Address.	Occupation.
27	Newbery.	F.R.Le Blanc	27/28 Charterhouse Square E.C.	Director
28	Koop.	Ernest C.	42/44 Moor Lane. E.C.	Merchant
30	Heath.	Frank Mason	19 Charterhouse St. E.C.	Silversmith
31	Joseph.	Seymour D.	28 Holborn Viaduct E.C.	Merchant
32	Lyons.	Joseph	26 W. Kensington Gardens W.	Gentleman
33	Broad	Henry Euskee.	Irongrove. Harpenden.	Merchant
34	Warren	William	108 Maida Vale W.	Gentleman
35	Newton	Alfred James	17 Cumberland Terrace N.W.	Baronet
36	Edwards	William	157 Queen Victoria St. E.C.	Gentleman
38	Zimmermann	John S. & C.A.	26/27 Cowcross Street E.C.	Manufacturer
39	Philpot	A.H. & H.B.	38 Marina St Leonards on Sea.	Costumiers
40	Ehrmann	Willy	50 Holborn Viaduct E.C.	Gentleman
41	Thomas	G. Holt.	Great Bookham.	Gentleman
42	Pilet	Henry	68 Regent Street W.	Gentleman
43	Mosenthal	William.	72 Basinghall Street E.C.	Merchant
44	Carl de Lafontaine	Henry J.	49 Albert Court W.	Rev.
45	Abrahams	Louis	Audrey House. Ely Place E.C.	Merchant
46	Cowley	John	17 Methuen Park N.	Gentleman
47	Burton	Pomeroy	The Old Mansion Hampstead N.W.	Gentleman

NOTE.—This margin is reserved for binding, and must not be written across.

* The Aggregate Number of Shares held, and not the Distinctive Numbers, must be stated, and the column must be added up throughout, so as to make one total to agree with that stated in the Summary to have been taken up.

† When the Shares are of different classes these columns may be subdivided, so that the number of each class held, or transferred, may be shown separately.

Form No. 8A.

Limited,

Persons who have held Shares therein at any time since the date of the last Return, showing their Names and Addresses, and an Account of the Shares so held.

ACCOUNT OF SHARES.						REMARKS.
* Number of Shares held by existing Members at date of Return.†		‡ Particulars of Shares transferred since the date of the last Return or (in the case of the first Return) of the incorporation of the Company by Persons who are still Members.		‡ Particulars of Shares transferred since the date of the last Return or (in the case of the first Return) of the incorporation of the Company by Persons who have ceased to be Members.		
		Number.†	Date of Registration of Transfer.	Number.†	Date of Registration of Transfer.	
Ordinary	Pounds.					
400	4					
200	2					
500	5					
1000	10					
250	5	Ordy 250	15th July 1909.			
300	3					
300	3					
500	5					
500	5					
300	3					
300	3					
200	2					
500	5					
500	5					
500	5					
300	3					
500	5					
125	—	Ordy 75	15 July 1909			
125	—					
"	"					
30,000	300					

(Signature) Frank K. Lovell

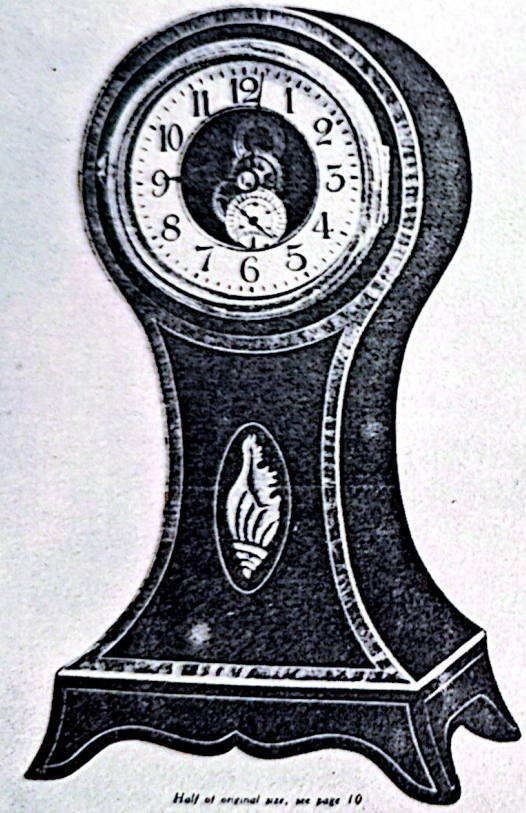
(State whether Manager or Secretary) P.T.O. Secretary

NOTE.—This margin is reserved for binding, and must not be written across.

‡ The Date of Registration of each Transfer should be given, as well as the Number of Shares transferred on each date. The particulars should be placed opposite the name of the Transferor, and not opposite that of the Transferee, but the name of the Transferee may be inserted in the "*Remarks*" column, immediately opposite the particulars of each Transfer.

JORDAN & SONS, LIMITED, 116 & 117 CHANCERY LANE, LONDON, W.C.

CATALOGUE
OF
EUREKA ELECTRIC CLOCKS



Half of original size, see page 10

EUREKA CLOCK CO., LIMITED,
361-363, CITY ROAD, LONDON, E.C.

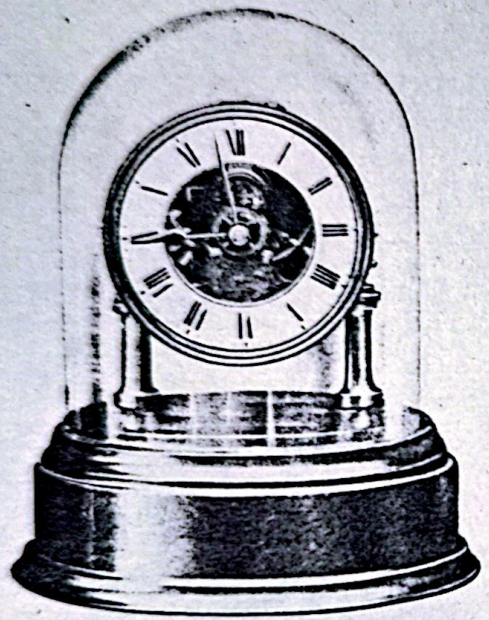
Special Selling Agents: S, M & Co., Ltd., London.

INSTRUCTIONS.

THE EUREKA (1000 day) ELECTRIC CLOCK needs no winding. Its moving power is one ordinary dry cell battery, which will keep the Clock running for two years or longer. When the battery is exhausted, you need not come to us for a new one. Any battery of the same or similar size as ours, which may be purchased anywhere for 1s. to 1s. 6d., will drive the Clock for another two years or longer, and is easily replaced by disconnecting the two wires from the old battery and connecting the new one instead. In purchasing a new battery insist upon getting one that is fresh. The Clock is practically silent and goes in any position, even if the mantel or stand on which it is placed is not quite level.

THE EUREKA CLOCKS ARE MANUFACTURED IN ENGLAND.

EUREKA (1000 DAY) ELECTRIC CLOCK.



No. 1

Round Base, with glass shade.

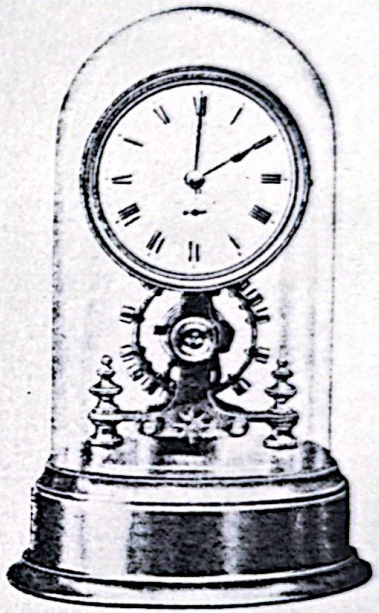
Movement behind dial.

Diameter of base, 8¼ ins. Diameter of shade, 6½ ins.

Height of Clock, inclusive of base and shade, 10 ins.

Gilt Ormolu or Silver Oxydized, price £4 . 4 . 0

EUREKA (1000 DAY) ELECTRIC CLOCK.



No. 2.

Round Base, with glass shade.

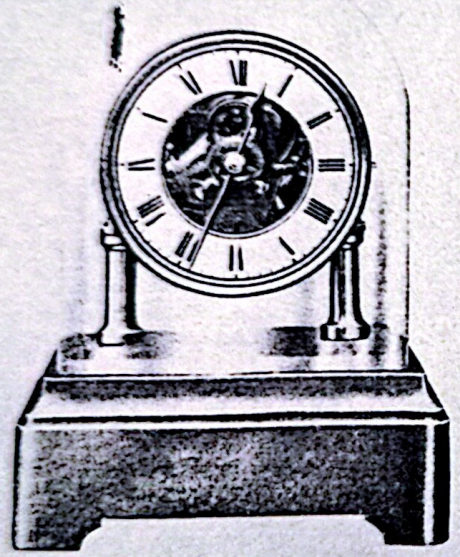
Movement below dial.

Diameter of base, 8¼ ins. Diameter of shade, 6½ ins.

Height of Clock, inclusive of base and shade, 13 ins.

Gilt Ormolu or Silver Oxydized, price £4 . 14 . 6

EUREKA (1000 DAY) ELECTRIC CLOCK.



No. 3.

Square Gilt Ormolu Base, with glass shade.

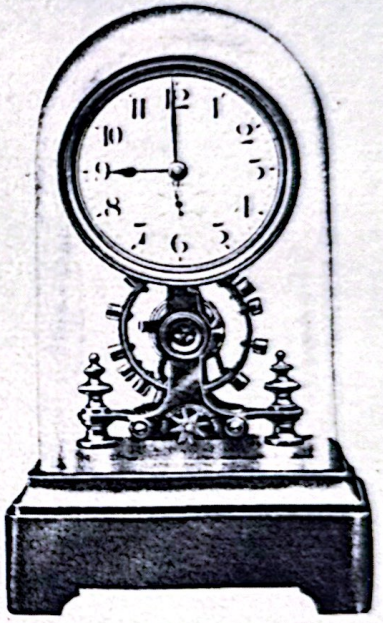
Movement behind dial.

Base, 7¾ ins. by 5¾ ins.

Height of Clock, inclusive of base and shade, 10 ins.

Price £4 . 14 . 6

EUREKA (1000 DAY) ELECTRIC CLOCK.



No. 4.

Square Gilt Ormolu Base, with glass shade.

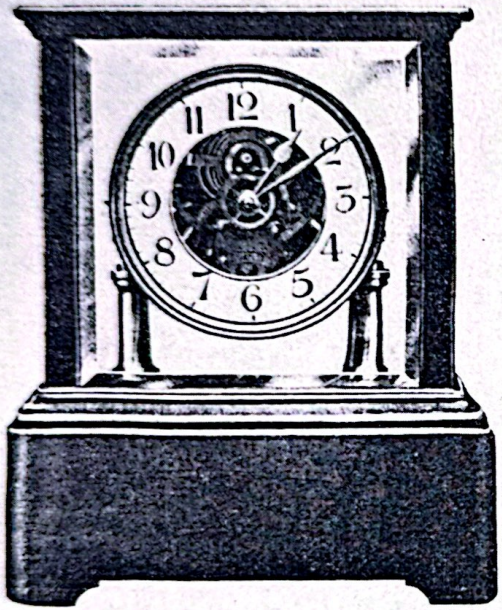
Movement below dial.

Base, 7¾ ins. by 5¾ ins.

Height of Clock, inclusive of base and shade, 13 ins.

Price £5 . 5 . 0

EUREKA (1000 DAY) ELECTRIC CLOCK.



No. 5.

Mahogany Base, with low bevelled Plate Glass Case.

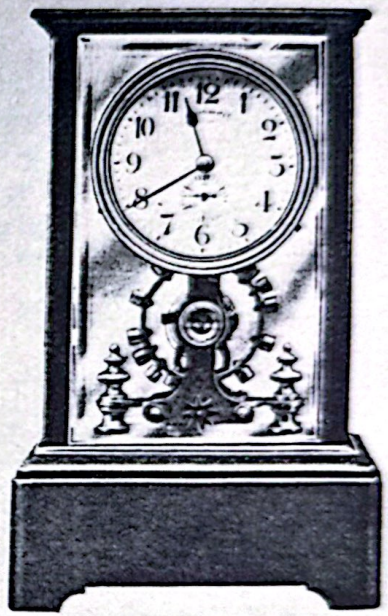
Plate Glass on all four sides. Glass case removable.

Movement behind dial.

10½ ins. high, 8¼ ins. wide, 6¾ ins. deep.

Price £5 . 5 . 0

EUREKA (1000 DAY) ELECTRIC CLOCK.



No. 6.

Mahogany Base, with high bevelled Plate Glass Case.

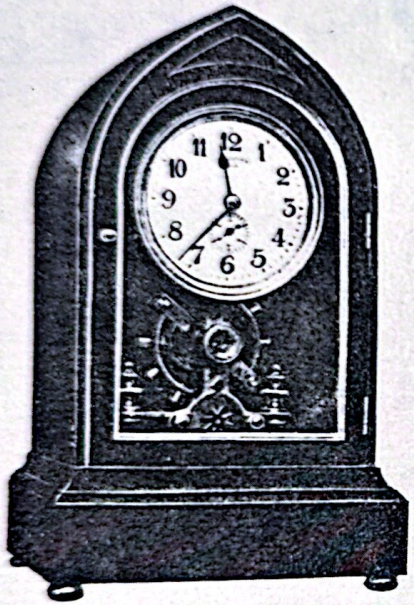
Plate Glass on all four sides. Glass case removable.

Movement below dial.

13½ ins. high, 8¼ ins. wide, 6¼ ins. deep.

Price £5 . 15 . 6

EUREKA (1000 DAY) ELECTRIC CLOCK.



No. 7.

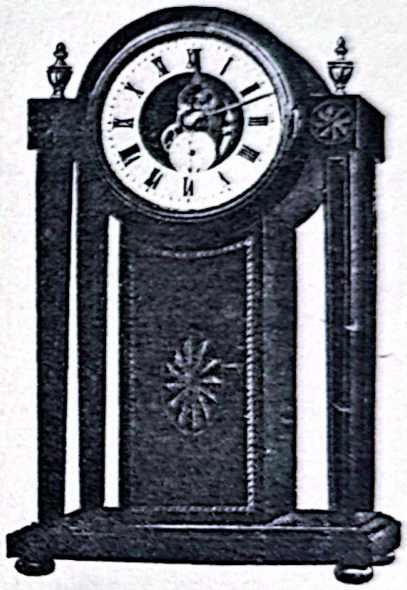
Mahogany Sheraton Gothic Case.

Movement below dial.

14¾ ins. high, 9¼ ins. wide, 6 ins. deep.

Price £6 . 6 . 0

EUREKA (1000 DAY) ELECTRIC CLOCK.



No. 8.

Mahogany Sheraton Pillar Case

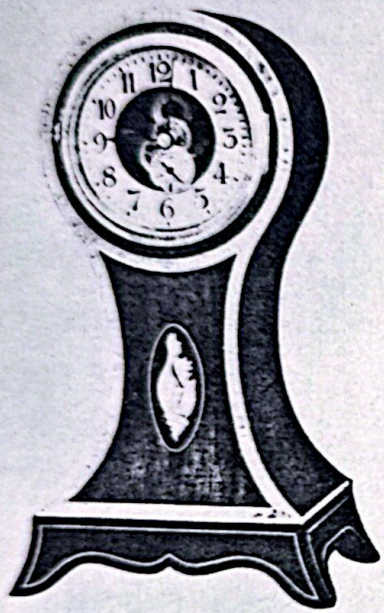
(Registered Design No. 536,494).

Movement behind dial.

14 ins. high, 8¾ ins. wide, 5 ins. deep.

Price £6 . 16 . 6

EUREKA (1000 DAY) ELECTRIC CLOCK.



No. 9.

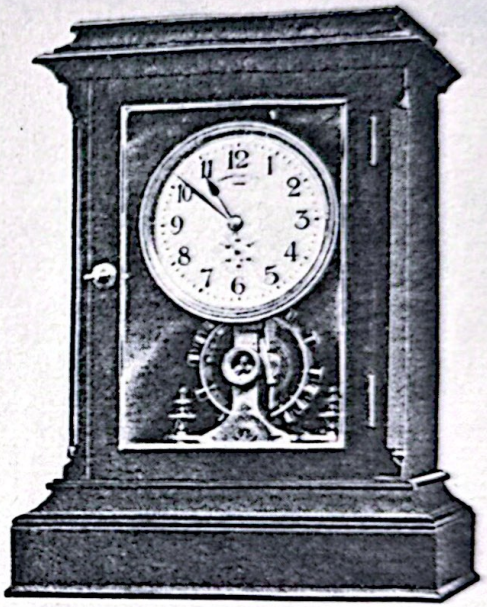
Mahogany Sheraton Balloon Case.

Movement behind dial.

14 ins. high, 8 ins. wide, 6 ins. deep.

Price £6 . 16 . 6

EUREKA (1000 DAY) ELECTRIC CLOCK.



No. 10.

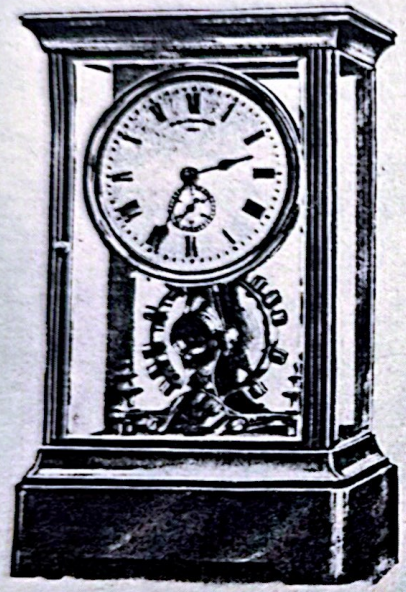
Mahogany Chippendale Square Case.

Movement below dial.

15 ins. high, 11¼ ins. wide, 6¼ ins. deep.

Price £6 . 16 . 6

EUREKA (1000 DAY) ELECTRIC CLOCK.



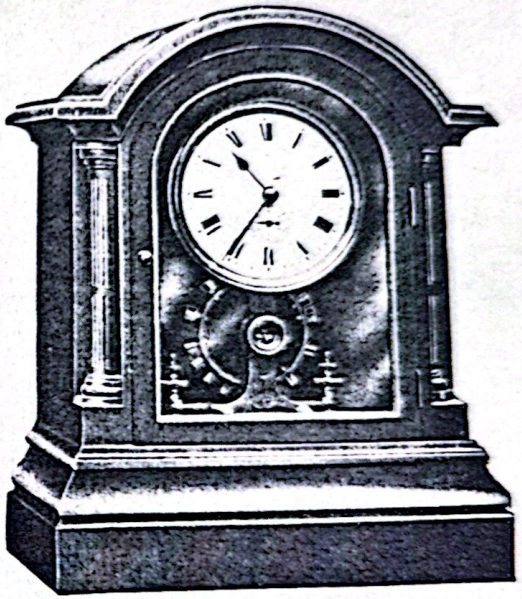
No. 11.

Bronze Gilt Ormolu Case.

12¾ ins. high, 7¾ ins. wide, 5¾ ins. deep.

Price £7 . 7 . 0

EUREKA (1000 DAY) ELECTRIC CLOCK.



No. 12.

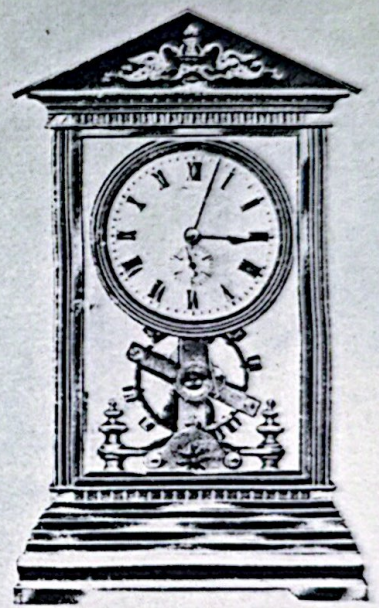
Mahogany, Early English Case.

Movement below dial.

15½ ins. high, 11¾ ins. wide, 6½ ins. deep.

Price £7 . 17 . 6

EUREKA (1000 DAY) ELECTRIC CLOCK.



No. 13.

Bronze Gilt Madelaine Case.

Movement below dial.

15 ins. high, 8¾ ins. wide, 7 ins. deep.

Price £8 . 18 . 6